PRIMARY PRODUCTION IN NEW ZEALAND

DEPARTMENT OF AGRICULTURE
WELLINGTON - - NEW ZEALAND

DEPARTMENT OF AGRICULTURE

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FOREWORD

BECAUSE the economic stability of New Zealand is dependent on its primary industries, and as organization and practice in those industries differ in many ways from systems in other parts of the world, there is naturally widespread interest in the Dominion's methods and policy.

The aim of "Primary Production in New Zealand," which appeared first in 1945, has been to provide in compact form a comprehensive picture of the organization of the Dominion's primary industries. For the 1952 edition there has been a complete revision of material.

E. J. FAWCETT,
Director-General of Agriculture.

J W. Prebble
Timaru Boys High
1955

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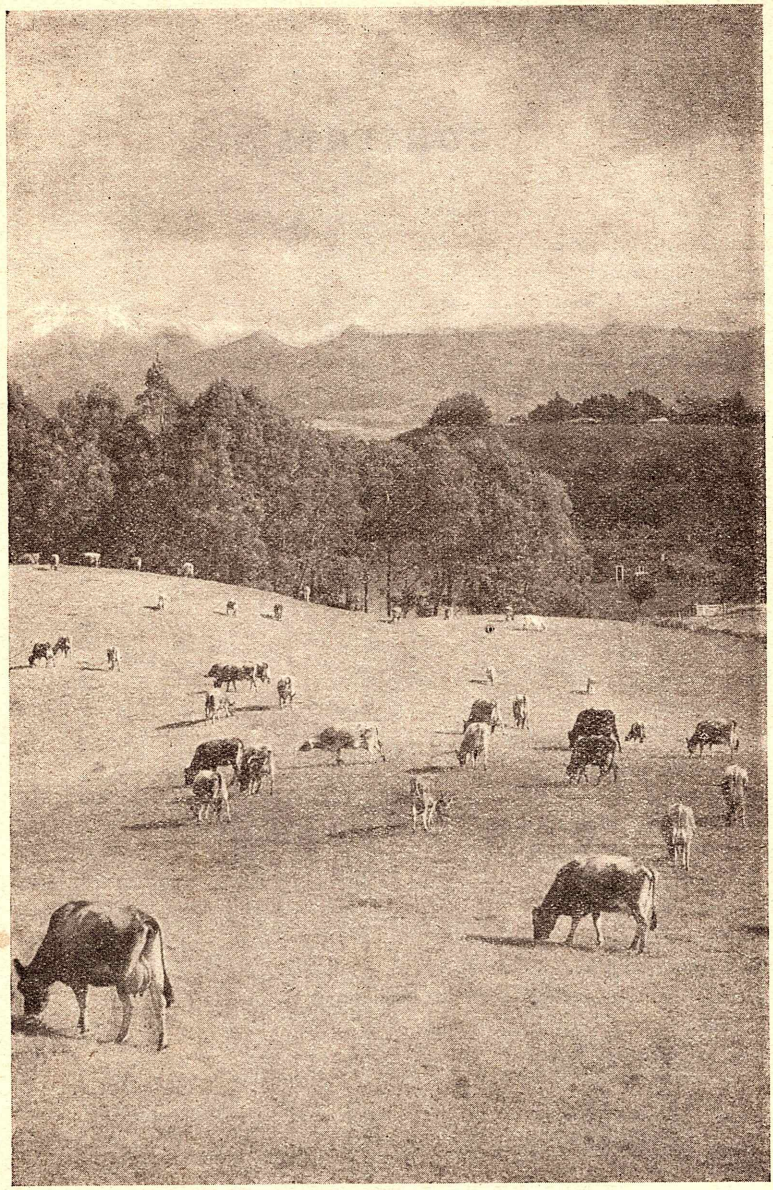


[*National Publicity Studios photo.*

Taranaki dairy farm.

LAND UNDER OCCUPATION

THE total area of New Zealand proper (that is, the North Island, South Island, Stewart Island, and adjacent islands, but excluding dependencies) was stated officially by the Department of Lands and Survey to be 66,390,722 acres as at 31 March 1948. Table 1 gives the condition of land as at that date:—

TABLE 1—TENURE OF LAND

	Acres.
Total area sold or granted and held on freehold	21,869,127
Total area reserved for public purposes	16,661,565
Total area of Crown land leased under all tenures (exclusive of reserves leased by the Crown)	15,890,723
Total area of Crown land available for future disposal	2,327,290*
Total area of Maori land	4,477,524†
Areas unfit for settlement, including rivers, lakes, roads, &c.	5,164,493
	66,390,722

* The greater portion of this land is unsuitable for settlement.
† Includes certain areas alienated by sale to Europeans.

CLASSIFICATION OF OCCUPIED LAND

According to the Government Statistician, of the total area of New Zealand, 43,253,908 acres were occupied as at 31 January 1950, exclusive of areas within cities and boroughs, &c., and of holdings of less than 1 acre.

TABLE 2—CLASSIFICATION OF OCCUPIED LAND

	Acres. 1950 (Provisional).
Improved Land—	
Sown pasture	17,946,229
Field crops	1,150,394
Plantations	907,741
Orchards	18,916
Grape vines	1,091
Passion fruit	84
Hops	605
Market gardens	13,369
Nurseries	1,642
Private gardens and land round residences	97,364
Fallow lands	90,999
	20,228,434
Unimproved Land—	
Tussock and other native grasses	12,929,127
Phormium tenax	46,413
Fern and scrub	5,223,975
Native forest	2,933,521
Barren	1,892,438
	23,025,474
Total occupied area	43,253,908

The table illustrates the essentially pastoral nature of New Zealand farming. Of the 43 million acres under occupation for agricultural and pastoral purposes, about 31 million consist of pasture lands—18 million

acres of sown pasture and 13 million acres of natural grassland. Little more than a million acres are devoted to annual crops, of which approximately half are cereals and half fodder crops.

The sown-pasture land consists of land sown to grass either after ploughing or after surface sowing following burning of forest. Although no recent data are available of the areas sown under each method, surface-sown pastures probably cover 11 million acres (9 million in the North Island and 2 million in the South Island) and pastures on cultivated land 6½ million acres (3 million in the North Island and 3½ million in the South Island). These pastures on ploughed grassland are managed intensively, through close subdivision, controlled stocking, and top-dressing with fertilizers and lime, and constitute the most important grassland areas in the Dominion, producing the bulk of the dairy-produce and meat exported.

TABLE 3—LIVE-STOCK TOTALS *

Cattle (at 31 January 1950)

Dairy stock—	
Breeding bulls, 2 years and over	61,867
Cows and heifers, 2 years and over—	
Cows in milk during season	1,845,510
Heifers not yet in milk	58,177
Cows not in milk during season, but intended to be used again for dairying	59,677
Heifers—	
1 year and under 2	394,224
Under 1 year	408,352
Bulls and bull calves under 2 years to be used for breeding	32,170
Total dairy stock	2,859,977
Beef stock—	
Breeding bulls, 2 years and over	22,358
Cows and heifers, 2 years and over	771,875
Heifers—	
1 year and under 2	199,443
Under 1 year	206,870
Steers, 2 years and over	455,675
Steers and bulls—	
1 year and under 2	207,929
Under 1 year	224,682
Total beef stock	2,088,832
Total cattle	4,948,809

Pigs (at 31 January 1950)

Under 6 months	351,795
6 months and under 1 year	112,337
Boars, 1 year and over	14,128
Sows, 1 year and over	74,112
	552,372

Sheep and Lambs Shorn and Lambs Tailed During Season 1949–50

Sheep shorn	31,525,570
Lambs shorn	6,332,148
Lambs tailed	21,169,846

* On holdings of 1 acre and over outside boroughs.

SYSTEMS OF FARMING

IN general the systems of farming follow closely along lines to be expected from the natural regions of the country—areas conditioned by topography, climate, and fertility to suit various types of farming. These regions range from the extensive tussock and native grass areas of the lower Southern Alps, which are suited only to one specialized type of sheep-farming, to the richer if more limited areas of level land adaptable to almost any type of farming. Although it should be remembered that any classification of farming systems is necessarily arbitrary and much overlapping occurs as between the various systems, the main systems in New Zealand may be set out as follows:—

On Tussock and Native Grass: The area on which this type of farming is conducted is all of high altitude and, although it includes a few plains and some rolling country, can be classed generally as mountainous. The climate is severe, with dry summers and cold winters. Occasionally heavy snow causes severe sheep losses. The main fodder is tussock and native grasses, and owing to overstocking and the depredations of rabbits (severe enough in some places to cause erosion) the carrying capacity of the land (never very high) has steadily declined. It averages now above one sheep to 4 acres. The stations are all large and the land is held mainly on leasehold from the State.

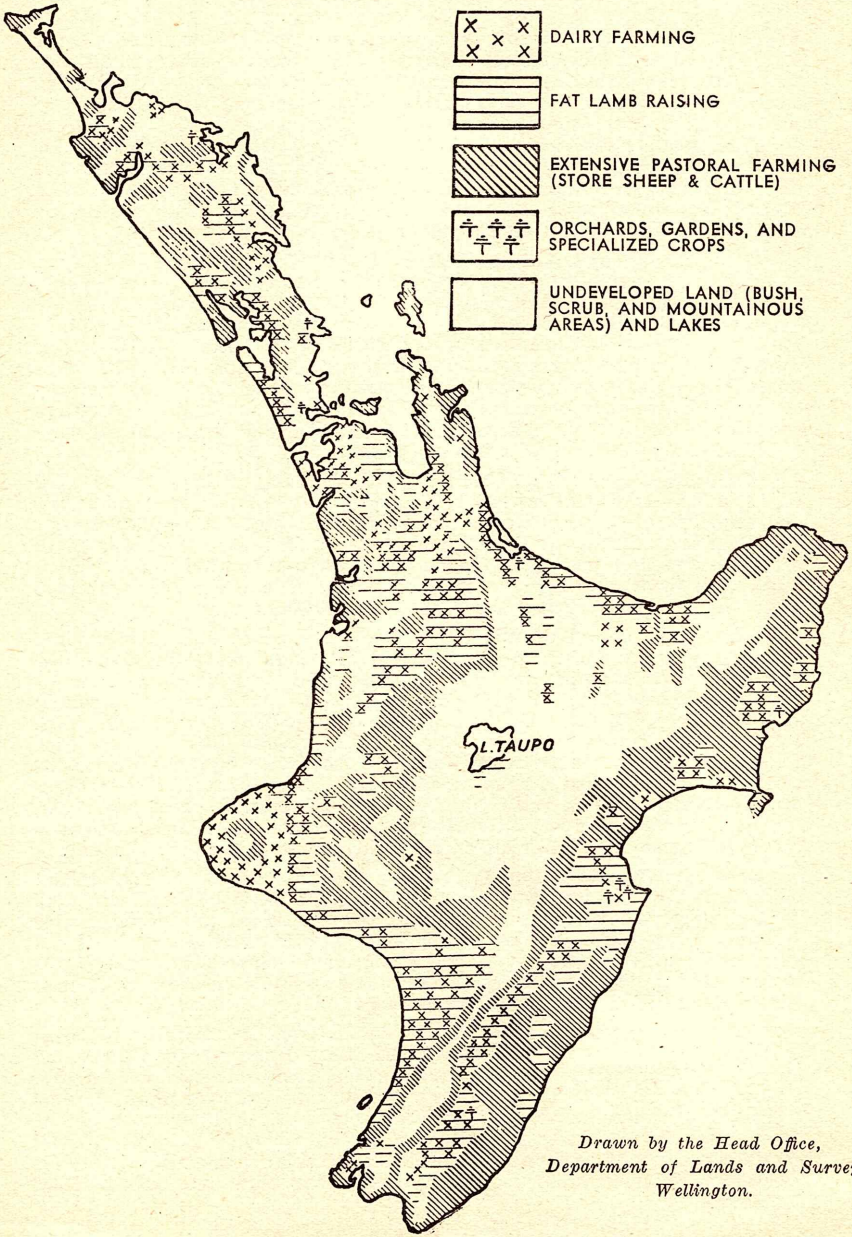
On Surface-sown Hills: The bulk of the farming of this type is carried on in the North Island on land which originally was cleared by burning and sown by scattering grass and clover seed in the cold ash. The class of stock carried depends on the type of sward. In the poorer areas fewer breeding-ewes and more hoggets and wethers are carried, and on areas where fern is encroaching farmers run more cattle. The farms average about 2,000 acres, carrying about one sheep to the acre.

South Island land of this type (fairly limited in extent) is utilized almost exclusively for sheep-farming, and in general sheep-farming is the mainstay of this region in both Islands. This type of farming is of considerable importance because it constitutes the main source of supply of store sheep for fattening by farmers on more level good-quality land. In the North Island more cattle are usually carried than in the South Island and the carrying capacity for sheep may be as high as three to the acre, plus some Polled Angus or Hereford cattle for fattening. These areas provide a considerable portion of New Zealand's wool and meat, not only as fat stock but indirectly as a source of store lambs and store cattle for farmers to finish off on the richer areas such as the Waikato.

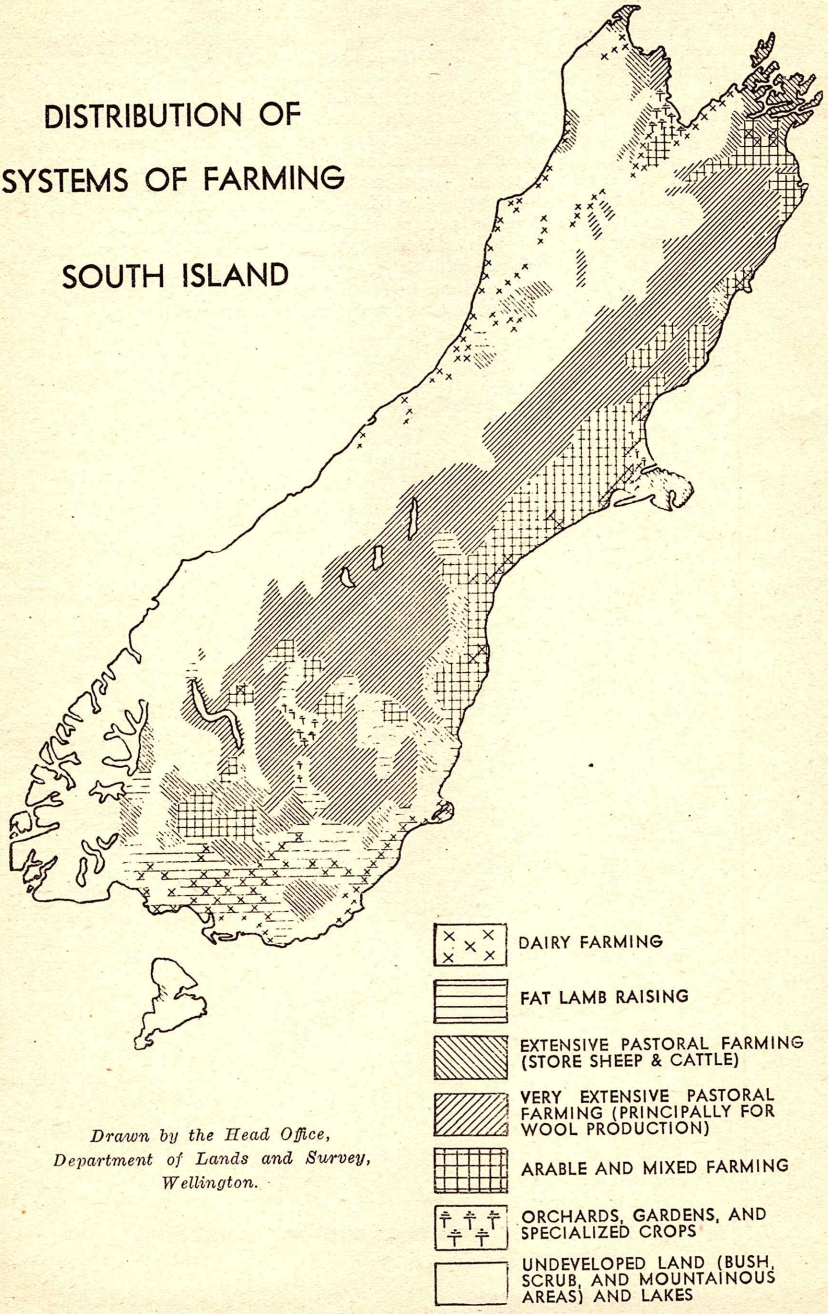
Intensive Grassland Farming: This is carried on on flat or rolling land of high fertility (either natural, or artificially produced by fertilizers) and usually is located in regions where climatic conditions are so favourable for pasture growth that there is sufficient grass to maintain stock all the year round, with a spring surplus for fattening. These farms carry three to five ewes per acre, or dairy cattle on the basis of one cow to 1½ to 2 acres (higher in a few exceptional cases).

Grass in the main feed for stock; in fact, on the majority of farms to-day no supplementary crops are grown. Surplus spring growth, particularly on dairy-farms, is conserved in the form of hay and silage. Pastures are of white clover and rye-grass supported by grasses such as cocksfoot, paspalum, and timothy and by red and subterranean clover. Once firmly established, pastures are rarely reploughed, "cultivation" consisting only of harrowing, rotational grazing, as explained in the section on dairying, and, above all, top-dressing with lime and artificial fertilizers.

DISTRIBUTION OF SYSTEMS OF FARMING
NORTH ISLAND


DAIRY FARMING
FAT LAMB RAISING
EXTENSIVE PASTORAL FARMING (STORE SHEEP & CATTLE)
ORCHARDS, GARDENS, AND SPECIALIZED CROPS
UNDEVELOPED LAND (BUSH, SCRUB, AND MOUNTAINOUS AREAS) AND LAKES
L. TAUPO

Drawn by the Head Office, Department of Lands and Survey, Wellington.


DISTRIBUTION OF
SYSTEMS OF FARMING
SOUTH ISLAND
DAIRY FARMING
FAT LAMB RAISING
EXTENSIVE PASTORAL FARMING (STORE SHEEP & CATTLE)
VERY EXTENSIVE PASTORAL FARMING (PRINCIPALLY FOR WOOL PRODUCTION)
ARABLE AND MIXED FARMING
ORCHARDS, GARDENS, AND SPECIALIZED CROPS
UNDEVELOPED LAND (BUSH, SCRUB, AND MOUNTAINOUS AREAS) AND LAKES

Drawn by the Head Office, Department of Lands and Survey, Wellington.

Arable Farming: This type of farming is confined almost entirely to the South Island, especially to eastern Canterbury and parts of Otago where climatic and soil conditions are most suitable for grain-growing. The rainfall is low, the summers hot and dry, and the land nearly all easily ploughable and of good quality. The farming here differs from other systems in that a considerable proportion of income is derived from growing and harvesting cereals, small seeds, potatoes, and other cash crops. Relatively few farms, however, are confined solely to arable farming. Usually some sheep, lambs, and cattle are fattened, and where the rainfall is higher a certain amount of dairying is carried on. Fat-lamb raising forms an essential link in the rotational farming chain. Green crops and roots, such as rape, spring grass, and turnips, are used to fatten store sheep and lambs and at the same time serve to spell and enrich the land after a period of grain-growing. The main crops are wheat, oats (both for threshing and for greenfeed), barley, and potatoes. Crop rotations are practised so that the land does not remain in pasture more than four to six years, with a shorter period in crops.

TOPOGRAPHY AND CLIMATE

TOPOGRAPHY

NEW ZEALAND is largely a mountainous country. Less than one-quarter of its land surface lies below the 650ft. contour. It thus presents a marked contrast to eastern Pacific countries, which have large areas of land below this level. The two islands of New Zealand are divided into eastern and western regions by the main mountain axis, which runs from the fiordland in the south to East Cape in the North Island. Although the mountain barrier is of little use for an intensive type of agriculture, it is important as a collecting basin for rain-water, which may be used for hydro-electricity or irrigation.

On either side of the mountain ranges there are only relatively small areas of flat land. These are mainly coastal strips and river valleys. Such lowlands are of limited extent and are not continuous. Other areas of flat land occur at higher altitudes in elevated inland basins. These lands, however, are outside the denser areas of settlement. Much of it, though occupied, is still unimproved land. Thus it is seen that the flat land in New Zealand is but a small proportion of the total area. (See maps on pages 12 and 14).

The chief areas of lowland in the North Island are as follows:—

1. The Waikato-Thames-Hauraki Plains: These plains are composed mainly of volcanic sediments derived from the Central Plateau. It may be mentioned here that the plains of the North Island are usually composed of finer sediments than those of the South Island. A considerable portion of the area was formerly swamp. Where this has been drained it has made good farming land. This lowland area is separated by a low range from the small, disconnected plains of the Bay of Plenty.

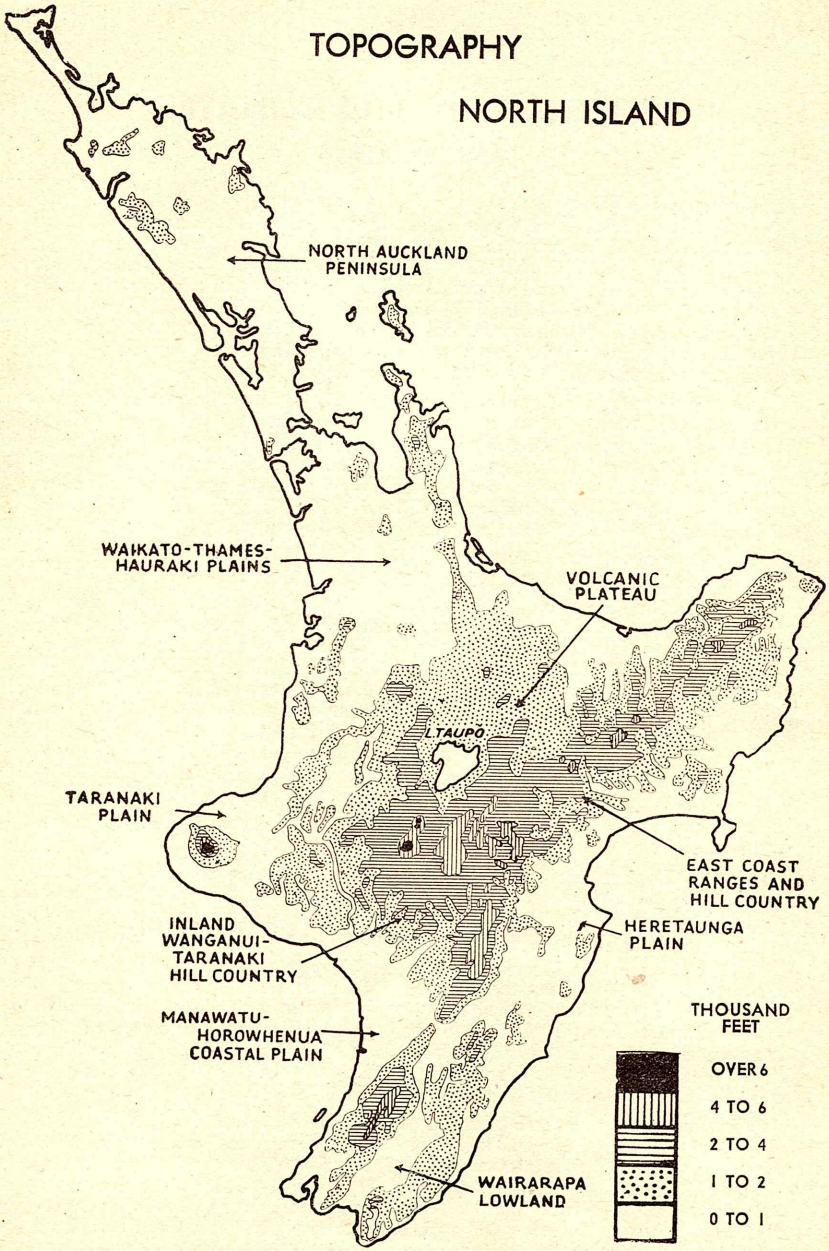
2. The Taranaki Plain: The Taranaki Plain is an elevated plain ending at the sea in cliffs. It is cut by the rivers which emerge from the hill country. At the present level of the rivers there are small areas of plain lying at a lower level than the general elevated surface of the country.

3. The Heretaunga Plain: This plain is the most extensive area of flat land on the east coast. It is roughly triangular and is formed of alluvial sediments deposited by the rivers which cross the plain. Since the earthquake of 1931 much land has been reclaimed from the Ahuriri Lagoon.

4. The Manawatu-Horowhenua Coastal Plain: The Manawatu Plain stretches from the Manawatu Gorge to the coast. From the gorge to Palmerston North the plain slopes steeply, but between the town and the sea the slope of the plain is more gradual and the river follows a winding course across it. This part of the plain is separated from the sea by a line of sand-dunes. The rainfall on the coastal belt is sufficient for dairy-farming on the light sandy soil.

Southward the coastal plain becomes narrower and is then known as Horowhenua Coastal Plain, as it is largely contained within the Horowhenua County. This plain consists of a series of terraces along the foot of the highland. On its outer edge it is fringed by sand-dunes and swampy hollows. These hollows, many of which were formerly covered with native flax (*Phormium tenax*), are numerous in the vicinity of Levin.

5. The Wairarapa Lowland: This lowland is a long valley running parallel to the high country and separating it from the coastal hill country. It is part of the gravel-filled lowlands which stretch northward to Hawke's Bay.



Drawn by the Head Office, Department of Lands and Survey, Wellington.

In the North Island the main units of the high country are as follows:—

1. The North Auckland Peninsula: This unit includes the North Auckland Peninsula and the smaller Coromandel Peninsula. The surface of the latter is mainly in native bush and scrub and is of little use for farming. The country of both these areas is complex in character. The chief areas of flat land are those along the rivers in the coastal areas. The region is mainly an upland of low elevation, generally below 600ft., but there are several peaks rising to 1,000ft. and 2,000ft. The region consists mainly of soft-rock uplands forming undulating country. There are also outcrops of resistant rocks, chief of which are the volcanic rocks forming outstanding and resistant masses. The coastline of the peninsula is often irregular and there are long indented inlets with extensive estuaries and mud-flats. There are also large areas covered with sand-dunes, such as those along the Ninety Mile Beach and in the far north.

2. The Volcanic Plateau: This plateau occupies the greater portion of the middle of the North Island. From it radiate the main systems of river drainage of the North Island. The plateau is built of volcanic material, its surface being relatively even, but often broken by volcanic cones and irregular ridges.

The greater part of the plateau surface is unproductive and unsuited to agriculture. Farming has been successful in a few areas, but is not characteristic of the plateau as a whole. Much of the country surrounding the plateau provides good grazing, tongues of land such as the Rangitaiki Valley penetrating inland to the plateau.

3. The East Coast Ranges and Hill Country: These mountains extend from Cape Palliser to East Cape, a distance of some 350 miles. Throughout their southern section the ranges are narrower than they are to the north of the point where they are cut by the Manawatu River. From this river gorge they widen out, the Kaimanawa Range extending westward toward the volcanic plateau as a wide belt of rugged mountain country. On the eastern side of the main range there is an extensive belt of hill country stretching to the coast both to the north and south of Hawke's Bay. The northern ridges of this soft-rock hill country lose elevation seaward. The slopes facing inland are steep, while larger and more gradual slopes face the coast. In these valleys there are few large rivers and it is only in the lower valleys that there are any areas of flat land. The largest area of flat land is the Poverty Bay flat formed by the valley of the Waipaoa River. To the south of Hawke's Bay the main ranges are usually separated from the coastal hill country by the chain of gravel-filled depressions referred to previously.

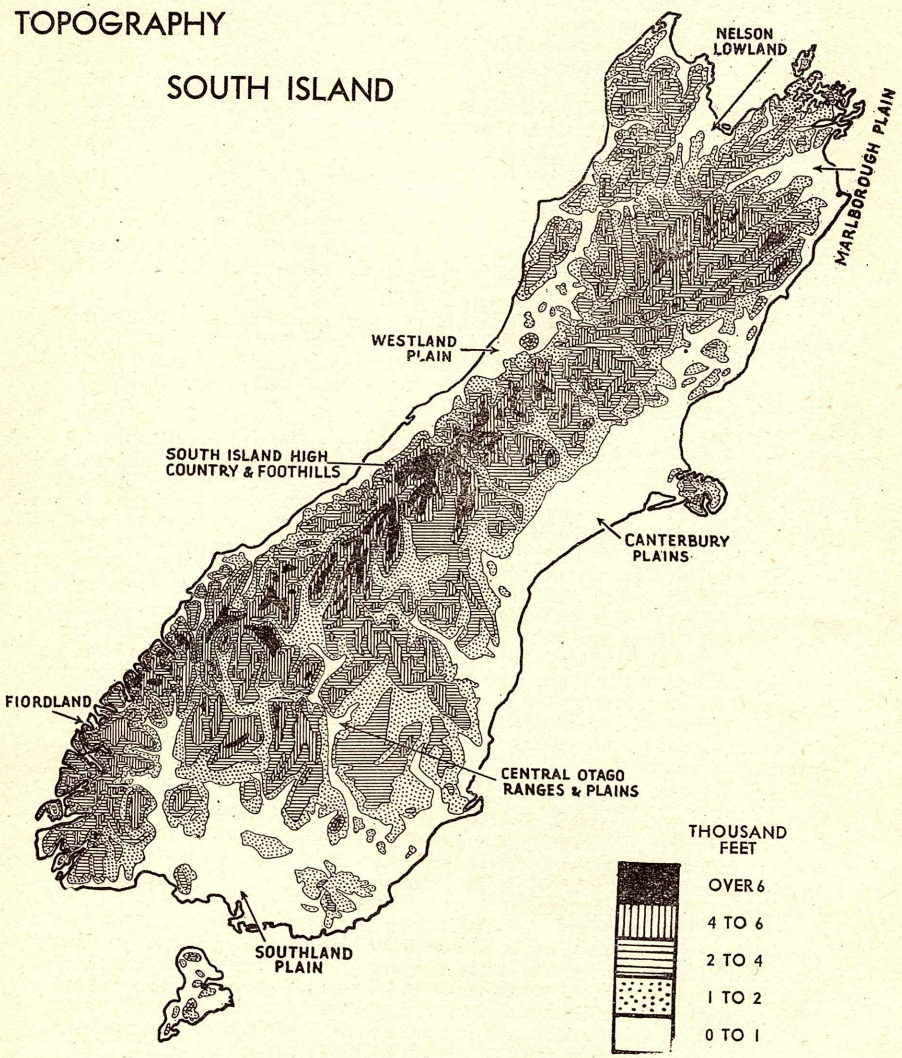
4. Inland Wanganui-Taranaki Hill Country: This tract of dissected plateau country fringes the western boundary of the volcanic plateau, from which it stretches to the volcanic cone of Mount Egmont. The hill country surrounding it is composed of soft rocks. The highest ridges are those further inland and overlooking the volcanic plateau. In the east it rises to 3,000ft., while in the west it is under 2,000ft. From the highest ridges there is an even slope of the land toward the coast. The whole plateau has been intricately and deeply dissected by streams. The ridges between the stream valleys have sharp crests and steep-sided slopes. It is important to note that this area of weak rocks and steep hill slopes is also one of high rainfall. The soil was formerly protected by a dense forest cover. To-day much of this type of land has been cleared. In places it is used for the grazing of stock; in others it is reverting to second growth.

The chief areas of lowland in the South Island are as follows:—

1. The Nelson Lowland: This lowland consists of a V-shaped area. It is in two sections separated from each other by the Moutere Hills, which are a low upland. The valley plains of the Motueka and Waimea Rivers to the east and west of the hills respectively comprise the best agricultural land, the higher land between them being poorer country.

TOPOGRAPHY

SOUTH ISLAND



Drawn by the Head Office, Department of Lands and Survey, Wellington.

2. The Marlborough Plain: This plain is bounded on the west by the mountains extending to the sounds country. Toward its upper end the valley plain of the Wairau is built of coarse sediments, but nearer the sea the plain is composed of finer sediments. The lower sections are flatter and were formerly swampy.

3. The Canterbury Plains: The largest unit area of flat land in New Zealand is formed by the Canterbury Plains, stretching from Amberley to Timaru. It is 40 miles wide in its middle zone and narrows toward either end. The plain consists of an immense thickness of gravel deposited by the rivers. These gravel deposits are thickest and coarsest close to the mountain upland. In general they are covered by a layer of fine material sufficient in depth to provide fertile soils suitable for the production of cereal and forage crops and of good sheep-farming pastures. Across the surface of the plain the main rivers have formed wide river-beds over which they are constantly changing their courses. Around the coastal margin of the plain are fringes of finer sediments, which also occur in the slight depressions between the river-beds. Around Christchurch there were areas of swamp. These have now been drained and form good heavy land. The remaining type of land on the plains is a narrow belt composed of beach ridges of sand-dunes extending from the mouth of the Waipara to Banks Peninsula.

4. The Southland Plain: The Southland Plain is formed of extensive deposits of gravel and silt. This is a highly productive region with high returns per acre, but its high productivity is possibly more closely related to its climate than to its soil formations.

5. The Westland Plain: This consists of a narrow and discontinuous coastal plain stretching along the western side of the Southern Alps. The lowland area often extends inland as along the valley of the Buller River.

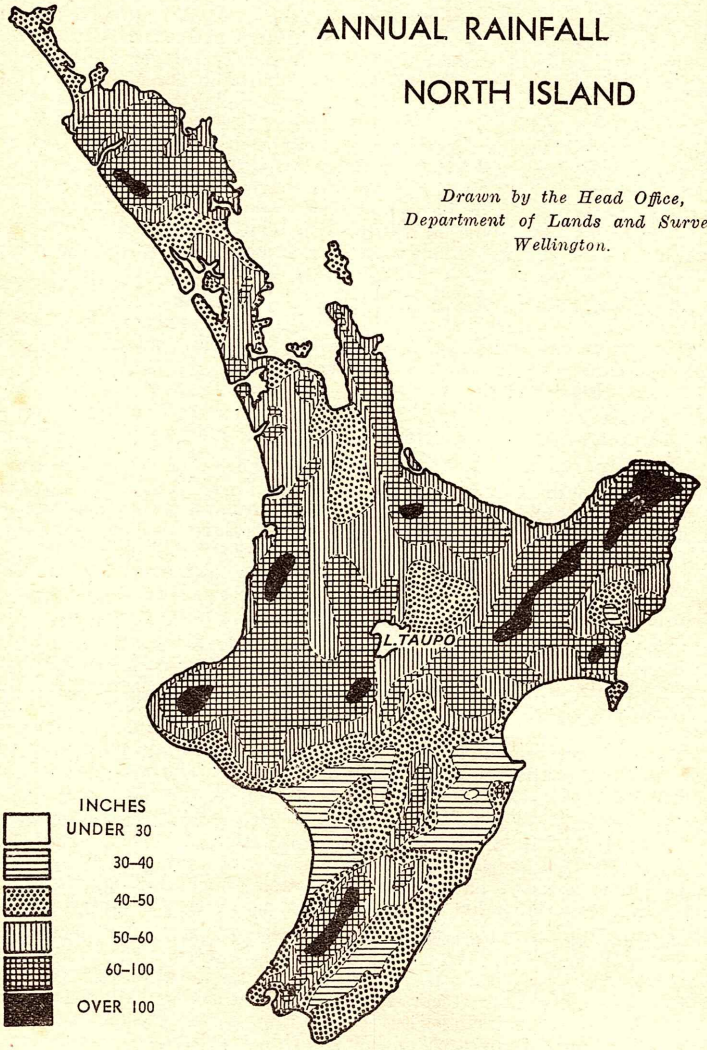
The main areas in the South Island high country are as follows:—

1. The South Island High Country and Foothills: This high country stretches from the northern boundary of Fiordland throughout the entire length of the island. The ranges are highest along their western margin, their bush-covered slopes rising steeply from the Westland Plain. On the tussock-covered area on its eastern side sheep may be grazed almost up to the snowline in the summer months. On the eastern side there is a belt of foothills country of lower elevation than the hard rock.

Highland: Hill country ridges extend to the coast in Otago and Southland, where they alternate with areas of softer rock and river valley plains. Banks Peninsula forms yet another isolated area of South Island hill country. It is separated from the main belt of hill country by the Canterbury Plains. This peninsula consists of an old volcanic cone which has been dissected and worn down by erosion. On its outer side, slopes are long and gentle till the summit is reached. The inner slopes facing the harbours of Akaroa and Lyttelton are much steeper.

Throughout the hill country there is little even land. Although this land is occupied, it is still largely unimproved land. The tussock-covered plains of the Mackenzie country provide a good example of this class of land. Other areas of flat land, a proportion of which is cultivated, occur in the Waikari, Culverden, and Cheviot basins of North Canterbury.

2. The Central Otago Ranges and Plains: The Central Otago ranges are of lower elevation than those of the high country. They are separated from one another by basin plains which lie at an elevation of from 1,000ft. to 2,000ft. They have steep, sharp faces overlooking a depression, while their back slopes are inclined less steeply toward a neighbouring depression. As Central Otago is an area of low rainfall, a great deal of land on river terraces is 200ft. to 300ft. above the water-table. As the present course of the rivers is at a lower level than the flat tops of the surrounding terraces, irrigation of this land is difficult. It would entail the building of dams and the digging of water-races, factors which have operated against irrigation in the drier areas. Moreover, the amount of land suitable for irrigation is only a small proportion of the total area.


ANNUAL RAINFALL
NORTH ISLAND
Drawn by the Head Office,
Department of Lands and Survey,
Wellington.
L. TAUPO
INCHES
UNDER 30
30–40
40–50
50–60
60–100
OVER 100

3. Fiordland: This area covers the southern and western part of the Island. It is mainly mountainous country with flat-floored valleys. Much of the land is over 5,000ft. It is agriculturally unproductive, its greatest value lying in its scenic attractions.

CLIMATE

The extremely favourable climate of New Zealand to a large extent accounts for the high agricultural productivity of the country. Owing to the geographic position of New Zealand the winds which reach it are moisture bearing. The main rainfall division of the country is east-west. The high relief accentuates the rainfall on the west coast, while in the east it gives rise to large areas of relatively low rainfall. The country benefits from an adequate rainfall (see maps, pages 16 and 18). In most of the habitable parts it is from 30in. to 75in. The efficiency of this rainfall is reflected in the luxuriant nature of the forest cover and the abundant growth of grass. In the North Island grass growth continues for the greater part of the year. In the South Island growth is checked during winter. In elevated regions and other areas which are sparsely settled the rainfall is more than 75in. This precipitation, from an agricultural point of view, is excessive. In parts of the tussock areas, however, rainfall borders on deficiency. In Central Otago the rainfall is from 10in. to 15in. In the semi-arid areas the landscape takes on a dry and barren aspect. There is little seasonal change in the appearance of the vegetation cover.

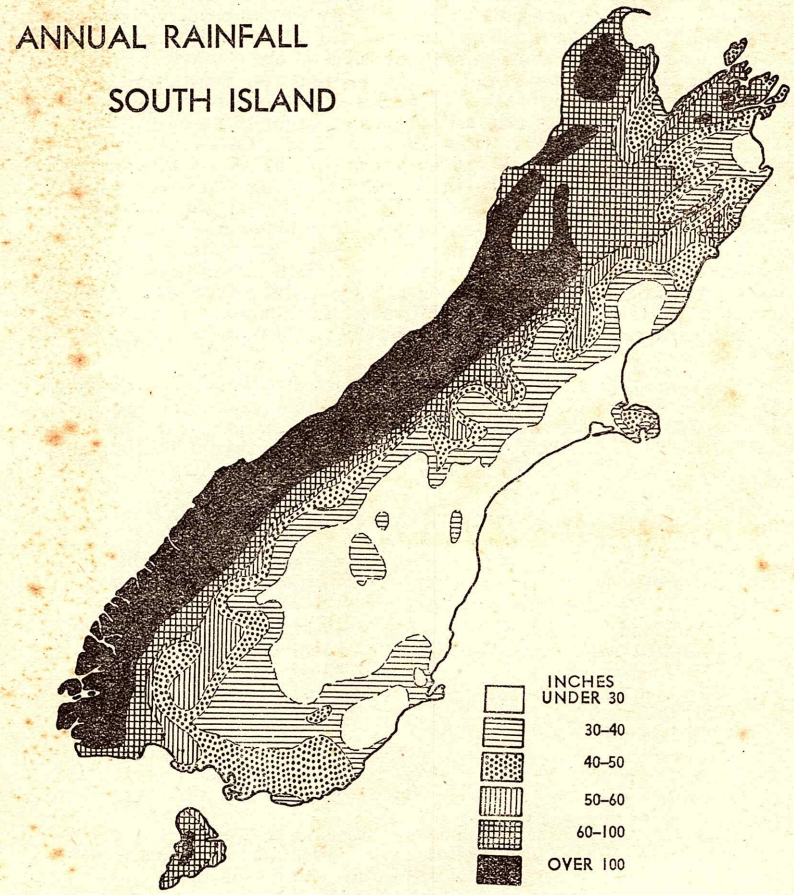
In general rainfall is adequate and evenly distributed throughout the year. The number of days on which rain falls varies throughout the country (Table 4). Even in the areas of heavy rainfall the number of rain days is limited. There is no month with less than 1·2in., except in Central Otago.

TABLE 4—AVERAGE ANNUAL RAINFALL

Station.	Average Annual Rainfall. In.	Number of Rain Days.
Auckland	49·14	183
Napier	31·48	114
Wellington	44·86	166
Nelson	38·22	119
Hokitika	114·64	188
Christchurch	26·10	126
Dunedin	37·25	161
Invercargill	44·74	199
Clyde	15·51	85

In certain regions there is, however, a marked seasonal concentration of rainfall. In North Auckland there is a definite winter maximum of rainfall, and this tendency is dominant as far south as Kawhia on the west coast and Banks Peninsula on the east. On the west coast from Kawhia to Fiordland there is a tendency to a maximum in October and a minimum in February, with a secondary maximum again in May. In dry areas to the east of the ranges, particularly in Central Otago, there is a concentration of rainfall in summer. In these interior situations climatic conditions resemble those prevailing in continental areas.

All areas east of the ranges, especially those in the South Island, are subject to strong north-west winds. These are hot, dry winds which often blow continuously for several days in summer and autumn. In the low-rainfall areas these drying winds reduce further the efficiency of the rainfall. Tussock formation which was almost devoid of large trees was the natural vegetation in these exposed areas.



Drawn by the Head Office, Department of Lands and Survey, Wellington

Rainfall fluctuations from the normal are important for agriculture, as they may determine the success or failure of crops. Twice in Canterbury and Marlborough since European occupation the rainfall record has fallen to half the normal. There is no record, however, of two continuous months without rain. Rainfall variability is highest and most serious in the areas of heavier precipitation. In regions of lighter rainfall a considerable departure from the average may not be serious. Rainfall is most reliable in those areas which receive rain from the westerlies—Taranaki, the west coast of the South Island, and parts of Southland. The suitability of Taranaki for dairying is doubtless related to this fact.

New Zealand has a high number of sunshine hours (Table 5).

TABLE 5—DURATION OF SUNSHINE PER ANNUM

Station.	Duration of Sunshine, in Hours.
Auckland	2,058
Napier	2,416
Wellington	2,040
Nelson	2,487
Hokitika	1,895
Christchurch	1,967
Dunedin	1,702
Invercargill	1,632
Lake Tekapo (Mackenzie country)	2,346

Nelson receives the longest duration of sunshine with 2,487 hours annually. Even Hokitika with 115in. of rain receives 1,895 hours of sunshine. This frequent alternation of heavy rain and bright sunshine distinguishes the climate of New Zealand from other parts of the world with a similar type of climate. Brilliant sunshine and sometimes strong wind after rain permit the rapid drying of the ground surface.

There is a definite range of temperature with latitude (Table 6). The average annual temperature varies from 59 degrees F. to 49. In the north, citrus fruits and tung plants can be grown. Seasonal ranges of temperature are least in the north, the difference being 12·5 degrees between the hottest and coldest month in the far north.

TABLE 6—AVERAGE ANNUAL TEMPERATURE

Station.	Temperature, Degrees F.
Auckland	59
Napier	57
Wellington	54
Nelson	54
Hokitika	51
Christchurch	52
Dunedin	52
Invercargill	50
Ophir (Central Otago)	49

In the far north only one ground frost a year is experienced, whereas Ophir (Central Otago) has a range of 25·4 degrees and 192 ground frosts a year. There is also a marked daily range in temperature in both summer and winter.

The following are outstanding features of the New Zealand climate: Winters are mild, with no continuous snow cover on the low country. Stock do not need to be kept under cover during winter, but in exposed positions the provision of shelter is beneficial. The rainfall is adequate and evenly distributed throughout the year. It falls on a limited number of rain days. There is thus a long duration of sunshine hours. The atmosphere is well washed, clear, and free from dust.

IMPORTANCE OF MACHINERY IN AGRICULTURAL DEVELOPMENT

THE importance of machinery in relation to farming cannot be too strongly emphasized. In the early days of sheep-farming, wool alone was of any great value. The local market for lamb and mutton necessarily was very restricted, even where facilities for transport existed. The advent of refrigerated shipping made it possible to send meat overseas, especially to Britain, where an almost unlimited market awaited it. The first trial shipment of meat and butter was made in 1882, and from then on development of the meat and dairy industries was rapid.

The next most important development in agriculture was the application of machinery to dairying: First, in the dairy factories, to handle the rapidly increasing quantities of milk being supplied by farmers, and secondly, on the farms. Before the introduction of home separation, farmers transported whole milk to the factories to be separated by large cream-separators, and where separated milk was required for feeding pigs or calves it was necessary to cart it home. With the subsequent can washing this was a laborious, time-wasting process. The development of home separation was a major forward step. With the application of the new pasture-farming technique the size of the herds increased rapidly and the problem of finding sufficient milkers could have become acute. It was solved, however, by improvements to the milking-machine, made possible largely by improvements in the quality of rubber. The rapid development of mechanization in dairying was possible only because suitable motive power was furnished as a result of increasing the efficiency of the internal-combustion engine, which was able to provide considerable low-cost power per unit of weight. Not only did this enable milking-machines to be used, but it made possible the development of mechanical shearing, which reduced labour requirements and greatly speeded up the process.

In recent years, of course, the internal-combustion engine in its application to the tractor has revolutionized all farm-cultivation and haulage.

The next revolutionary step was the construction of hydro-electric units and the subsequent reticulation of country areas with electric power. Electric motors have almost supplanted internal-combustion engines, electric power having the additional advantage of being available for other uses, such as water-heating for cleaning and sterilization and for use in the farm home.

An extremely important aspect of farm machinery development has been that concerned with water-supply and pumping equipment. The provision of an adequate water-supply is, of course, essential when subdividing a farm into the small fields required for intensive grassland farming. Whether the source of supply is a bore, a well, or a convenient creek or spring, some type of pump (driven either by an electric motor, an internal-combustion engine, or, occasionally, a windmill) is essential for distributing the water by pipes to conveniently placed concrete drinking-troughs. Similarly, on most dairy-farms supplying cream for buttermaking the skimmed milk resulting from separation is pumped into containers at the piggery, which, by regulation, must be a considerable distance from the milking-shed.

There are, unfortunately, no statistics available of the number of pumps in operation on farms, but the total is known to be considerable. In addition to pumps used on dairy-farms, other large-scale types are used for irrigation purposes, for removing flood water, or in connection with drained swamp land.

In arable farming the most important development in the use of machinery has been the replacement of farm horses by tractors. The number of reapers-and-binders, threshing-machines, and chaffcutters has not changed substantially over the years. With the use of tractors it has

been possible to employ much better types of cultivation equipment because of the greater draught power of tractors compared with horses.

A further and comparatively modern application of machinery which will modify farming practices has been the development of heavy machinery, some purely for agricultural purposes, some for other types of work, but with application to agriculture. In the first of these categories is the combine, which has completely revolutionized wheat harvesting, and the pick-up baler, which may change haymaking practice to a similar extent. Machinery of this kind is generally too costly for the farmer of average means, and in consequence there has appeared the farm contractor. The contractor can make full use of heavy equipment by performing work on contract for farmers who, by purchasing implements such as combines or mechanical drain-diggers, for which they would have a limited use, would find themselves seriously over-capitalized.

In land development extensive use is now being made of heavy earth-moving machinery to remove stumps, drain swamps, construct roads and culverts, develop irrigation projects, and for the usual processes of ploughing, cultivating, and sowing.

MACHINERY ON FARMS

The steady increase in the use of machinery on farms is illustrated by Table 7 (figures quoted are for holdings of more than 1 acre situated outside boroughs).

TABLE 7—MACHINERY ON FARMS

	1920.	1930.	1940.	1950.
Water wheels or motors—				
Number	640	923*		
Approximate horse-power	2,828	3,555*		
Steam-engines—				
Number	719	398*		
Nominal horse-power	3,761	1,771*		
Portable or traction engines—				
Number	1,039	817*		
Nominal horse-power	6,313	5,076*		
Reapers-and-binders—				
Number	13,105	15,484		8,521
Threshing-machines—				
Number	387	418		†3,754
Chaffcutters—Number	3,140	2,206		1,350
Wool-presses—Number	7,903	9,906		18,754
Internal-combustion engines—				
Number	15,685	19,169	23,346	29,841
Nominal horse-power	52,250	58,052	72,250	84,701
Electric motors—				
Number	456	16,456	56,511	110,380
Nominal horse-power	1,611	28,638	58,623	100,487
Agricultural tractors—				
Number	380	3,891	11,278	34,683
Nominal horse-power	6,694	59,217	203,387	808,267
Milking-machines—				
Number of plants	10,450	20,415	29,564	36,316
Number of stands	N.A.	72,147	100,817	138,998
Cows in milk on holdings employing milking-machines	N.A.	967,131	1,445,756	1,714,414
Cream-separators—Number	32,024	48,302	55,773	54,303
Shearing-machines—				
Number of plants	5,354	7,394	10,634	18,756
Number of stands	17,618	21,482	27,216	40,535
Rotary hoes—				
Number			813‡	3,086
Nominal horse-power			4,754	14,379

* Last year collected.
† Includes 347 threshing-mills, 277 tin mills, and 3,130 header harvesters.
‡ 1942 figures.
N.A., not available.

HORSES IN NEW ZEALAND

With the increase in the use of machinery, especially tractors, there has been a decrease in the number of horses. Unfortunately, before 1930 statistics of horses were collected on a different basis from that used later, and from available data it is not possible to state with certainty which of the figures in the earlier period related to "farm horses." Statistics available from 1931 are shown in Table 8.

TABLE 8—HORSES ON FARMS

Type—	1931.	1940.	1950.
Draught and three-quarter draught	127,730	122,245	71,811
Spring-cart or light artillery (including half-draughts)	47,652	48,561	26,252
Hacks and light working horses	91,135	73,227	76,715
Thoroughbred and other horses	16,212	14,534	20,068
Totals	282,729	258,567	194,846

RURAL TRANSPORT

SOME major problems have always been associated with transport in New Zealand. The three main factors contributing to those difficulties are—

(1) The long narrow shape of the country.
(2) Its mountainous nature.
(3) The fact that it is divided into two main islands.

Another factor linked with the country's broken topography is the absence of rivers navigable for considerable distances. Thus nothing similar to the river-canal systems of Europe has been even remotely possible. The surface configuration of New Zealand, too, has made road and railway construction both difficult and expensive, involving numerous bridges, culverts, and tunnels.

In the early days, when most settlements were near the coast, sea transport was quickest and most convenient. Large quantities of goods are still carried by sea between coastal towns and there will always be inter-Island communication by sea.

DEVELOPMENT OF RAILWAYS

The most important part in the development of communications, however, has been played by the railways. The first line in New Zealand, between Heathcote and Christchurch, was opened in 1863, but subsequent construction was slow until the "seventies," when Sir Julius Vogel's public-works programme resulted in rapid development. The Auckland-Wellington Main Trunk line was not completed until 1908 owing to the difficulty of negotiating numerous obstacles. By 1921, however, some 3,000 miles of line had been laid, and during the past thirty years only 500 miles of new line has been added. Actual mileage of lines at 31 March 1951 was 3,531.

In spite of the rapid growth of motor transport, the railways are still the basis of all internal transport, especially of heavy goods and long-distance passenger transport. Nearly all farm produce—butter, cheese, wool, meat, and live-stock—is carried by rail to ports or elsewhere. Railways provide cheap transport for fertilizer, lime, cement, fencing-posts, machinery, coal (to dairy factories and freezing-works), and many other essential commodities.

Though railways solved the problem of arterial transport, it was still necessary to transport goods to and from stations. Before the development of motor transport, and for some time after, roads were in an extremely bad condition. Beginning as bridle tracks along which goods were transported by packhorse, or as the routes followed by bullock teams, roads developed rather haphazardly. But with the advent of the motor-vehicle came an era of rapid improvement. In 1922, under the Main Highways Act, Boards were set up to assume control of all the main arterial roads in the country. County Councils are directly responsible only for the upkeep of secondary roads within their boundaries, although portion of their rate collections goes to the Main Highways Board. To-day only the more isolated and undeveloped settlements do not have all-weather roads, although there are still a few back-country sheep-stations which send out their wool by pack-horse.

ROAD DEVELOPMENT

Table 9 gives some idea of road development since 1920 (statistics are for roads in counties only and exclude boroughs, Town Boards, and Road Boards):—

TABLE 9—ROAD DEVELOPMENT

Roads formed to not less than dray width and surfaced with—	1920. Miles.	1930. Miles.	1940. Miles.	1949. Miles.
Bituminous or cement concrete	.....	90	150¾	164
Bitumen or tar	.....	928¾	3,177½	4,307
Metal or gravel	21,808½	28,374¼	36,163¼	37,154
Other or unspecified material	.....	45	.....	.....
Roads and streets formed to not less than dray width, but not paved or surfaced	14,833½	14,047½	9,192	7,504
Total formed roads	36,642	43,485½	48,683½	49,129
Bridle tracks	4,901	5,200¾	5,774¾	5,594
Unformed legal roads	12,680	15,506	16,761½	17,137
Total	54,223	64,192¼	71,219¾	71,860

Apart from the direct influence of improved transport facilities for conveying goods and produce, there are other ways in which rural life has benefited. Many farmers now have their own trucks which they use not only for carting goods and live-stock, but also internally on their farms to speed up various routine work such as feeding hay, silage, and root crops to stock and in hay- and silage-making operations. The speed of motor transport greatly improves the amenities of rural social life. Illness and accident no longer hold the same terrors for those living in isolation, because, with the use of motor transport, doctors are now readily available. A farmer, too, can call on the services of a veterinarian even if his farm is twenty or thirty miles from a centre.

It would not be exaggeration to say that the set up of New Zealand farming to-day would not be possible without modern mechanized transport.

ECONOMIC IMPORTANCE OF FARMING

IN its concentration on live-stock - pastoral farming, New Zealand agricultural technique is in many respects unique. The productivity per unit of labour is very high (the Oxford economist Colin Clark estimates it to be the highest in the world) and the range of products is limited. Most significant in New Zealand farming is the fact that by the development of this highly specialized grassland farming the relatively few people engaged can achieve a very high total output. Total population at the end of 1950 was 1,900,000; annual production (five-year average) was 149,000 tons of butter, 95,000 tons of cheese, 550,000 tons of meat, and 165,000 tons of wool.

Local consumption of primary products is very high per head of population, but even at its maximum it absorbs only a small part of total production. New Zealand has considerable supplies of meat, dairy-produce, and wool (as well as certain by-products such as hides and tallow) available for export, although these supplies are not "surpluses for export" as they are often termed. They are deliberately produced for export and are of a type and quality demanded by overseas markets.

PRODUCTS MAINLY OF ANIMAL ORIGIN

In 1950 New Zealand's total exports were worth £184 million (excluding specie). Ninety-five per cent were products of animal origin and the bulk of the remainder other primary products. Imports for the corresponding period were £158 million, of which manufactured goods and raw materials formed the largest part. Thus exports per head of population were £95 and total external trade £176. It is by exchanging exports of primary products for manufactured goods which cannot be produced in New Zealand and for raw materials for secondary industries that New Zealand is able to maintain a high standard of living. At the same time the Dominion's dependence on the export of a few specialized lines makes it extremely sensitive to price changes in the world market. This was clearly shown during the depression of the 1930's, when a substantial drop in meat, wool, and dairy-produce prices caused such a drop in the national income that business depression, farm losses, and unemployment became widespread.

There does not appear to be any ready means of avoiding this dependence on exports, or even of diversifying primary industry to avoid reliance on a few specialized lines. There is the consolation, however, that New Zealand produces staple lines (mostly foodstuffs) for which demand is always likely to be considerable.

THE SHEEP INDUSTRY

THE first sheep to reach New Zealand were two Merinos landed by Captain Cook in Marlborough Province in 1773. These were the sole survivors of a small shipment he had brought with him from Cape Colony, but they died soon after being landed. In 1814 the Rev. Samuel Marsden brought over a few Merinos to the Bay of Islands from New South Wales, but there is no record of their permanent survival. It seems that it was not until 1834 that sheep became permanently established in New Zealand, when John Bell Wright brought 102 Merinos from Sydney and landed them on Mana Island, some twenty miles north of Wellington, off the west coast of the North Island.

In the early 1840's sheep-stations were established in the Canterbury and Wellington Provinces, and soon afterward in other districts. The first sheep-stations were stocked entirely with Merinos, but it was soon found that the wetter climate of parts of the North Island did not suit the breed as well as many districts of the South Island. There they became firmly established in the high country, which has remained their stronghold ever since. During the "fifties" and "sixties" of last century a number of English breeds of sheep were imported, notably Southdowns, English and Border Leicesters, Romneys, and Lincolns. As time went on, other breeds were introduced, but some of these, such as the Cotswolds and the Hampshire Downs, did not persist for long. An outstanding event of this period was the evolution of New Zealand's own breed—the Corriedale—which finally emerged, toward the end of last century, as a great new dual-purpose breed. It traces its ancestry to the crossing of three other breeds: the Merino, the Lincoln, and the English Leicester.

CHANGES FOLLOWING REFRIGERATION

Until 1882, the year which marked the successful introduction of refrigeration in New Zealand, the Merino and its crosses were predominant, because the only sheep products of any importance for export were wool and a little tallow, obtained by boiling down carcasses. With the advent of refrigeration, however, an entirely new field was opened up and the British breeds of sheep began to come into their own. Considerable cross-breeding with the Merino took place, and it was not very long before this breed began to decline in numbers and gradually became confined to the higher and poorer country of the South Island, where it has persisted.

Before long the Merino, as a purebred, was almost completely superseded in the North Island by the British longwool breeds, which were more suited to the climate and conditions. Considerable numbers of Lincolns and English Leicesters were run on the new "bush-burn" country (that is, country which had been cleared of forest by felling and burning, leaving blackened stumps and logs), as their wool stood up well to the rough conditions. Lincolns and English Leicesters in turn were gradually displaced by the Romney, and to-day the flock sheep of the North Island are nearly all crossbreds of the Romney-Lincoln type, with Romney blood predominant.

In the South Island the position was more complicated. As the Merinos became restricted to the foothills of the Southern Alps it was found that the use of the half-bred (first cross of a Merino with a longwool) and the Corriedale could profitably replace Merinos on much of the better hill country. Lower down three-quarter-breds (the result of crossing half-bred and longwool) and the longwoolled British breeds were found to be more profitable. It is significant, however, that in the South Island, Merino blood in varying degree continued to play an important part in the flock structure, while in the North Island the Romney became by far the most important influence.

IMPORTANCE OF SHEEP-FARMING

Of New Zealand's total area of some 66 million acres, almost 43 million are in occupation for primary production. Lines of demarcation between different types of farming are not always very distinct, but approximately 37 million acres are devoted to pastoral production. Of this total, it has been estimated that about 5 million acres are used for dairy-farming, leaving approximately 32 million acres, or nearly half of New Zealand's total land area, for sheep-farming. It must be emphasized, also, that much of this land is unsuitable for any other of our present types of farming, so the important role of the sheep in farming economy is at once obvious.

DISTRIBUTION OF SHEEP

As will be seen from the maps on pages 28 and 30, the density distribution of sheep varies greatly from one part of the country to another. This distribution is governed to a large extent by climate and topography, although other factors have some influence. The sheep is a hardy and adaptable animal, but does not thrive where the rainfall is excessive. It can tolerate a wide range of temperatures, but New Zealand's generally temperate climate is almost the ideal for sheep. Topography is far less a restricting influence on sheep than on dairy cows and it is only on the steepest and highest ranges that there are no sheep. At the other end of the scale, sheep tend to be replaced on the better pastures by dairy cows, which usually show a higher rate of net profit per acre.

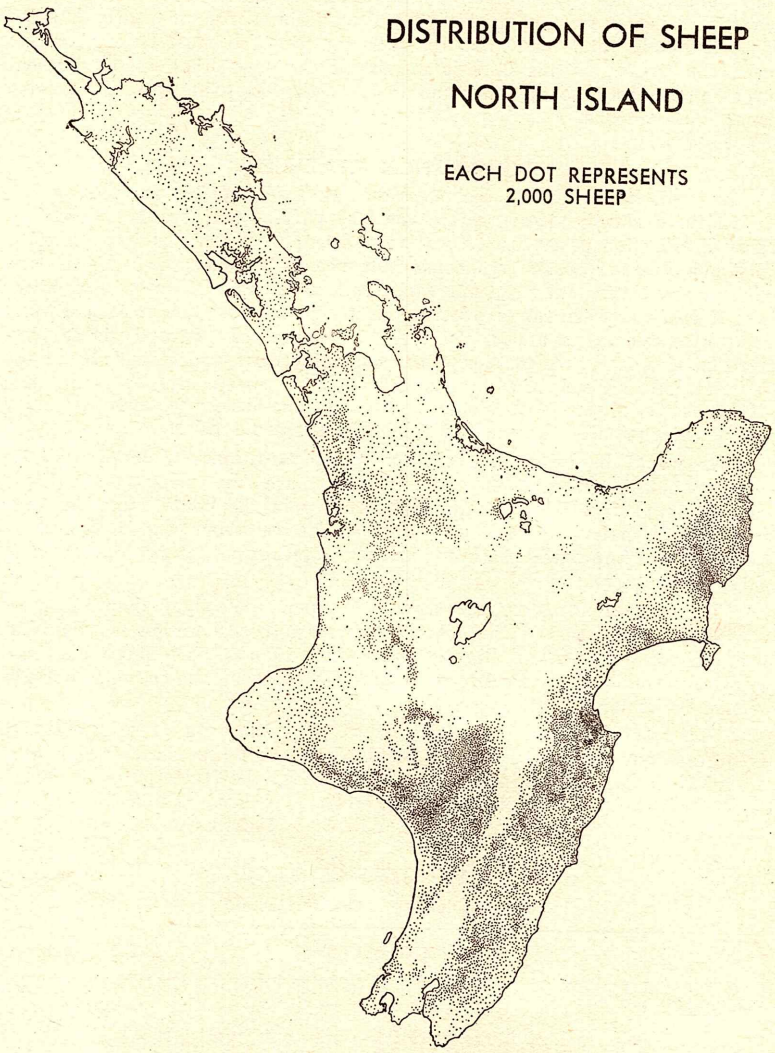
As would be expected from the great variations in density of the sheep population, the country on which they are run varies greatly in its carrying capacity: Some of the high country in the South Island covered with sparse native grasses and tussock carries about one sheep to 10 acres, while improved pastures, heavily top-dressed, carry six or more sheep to the acre.

The annual sheep returns as at 30 April 1950 show that there are 33,856,558 sheep and 33,589 sheep-owners in the Dominion, so that the average size of flocks is slightly more than 1,000. This figure has been relatively stable since the beginning of the century, but previously flocks tended to be larger.

The reduction in the average size of flock has been brought about to a large extent by the subdivision of many of the large estates which were a typical feature of the pioneering days and by the inclusion of the small flocks which are often run on dairy-farms to-day. Table 10 gives a concise picture of the size of flocks and their distribution.

TABLE 10—SIZES OF FLOCKS
(Annual sheep returns, 1950)

—	Owners of Sheep Owning									Total Number of	
	1–200.	201–500.	501–1,000.	1,001–2,500.	2,501–5,000.	5,001–7,500.	7,501–10,000.	10,001–20,000.	Over 20,000.	Owners of Sheep.	Sheep.
North Island	3,269	3,359	3,879	4,893	1,252	252	69	58	8	17,039	19,020,902
South Island	3,484	3,735	4,352	4,087	690	132	38	28	4	16,550	14,835,656
Totals—Dominion	6,753	7,094	8,231	8,980	1,942	384	107	86	12	33,589	33,856,558



Map prepared by Dr. W. M. Hamilton, Department of Scientific and Industrial Research.

Certain districts tend to have larger flocks on the whole than others. For example, in the Gisborne-Hawke's Bay district about 57 per cent of the flocks are of 1,000 and over, whereas in the Marlborough-Nelson-Westland district only some 13 per cent of the flocks are of 1,000 and over. Table 11 gives a further comparison of districts.

TABLE 11—COMPARISON OF DISTRICTS, 1949–50

District.	No. of Sheep.	Total Area Occupied (Acres).	Sheep per 1,000 Acres.	Estimated Lambing Percentage.	Dairy Cows in Milk Per 100 Sheep.	Predominating Breed of Sheep.
North Auckland	1,218,550	3,243,840	376	92·31	34·18	Romney
Auckland	3,453,878	4,903,351	704		19·26	Romney
Gisborne	2,140,750	2,006,558	1,070	92·40	2·06	Romney
Hawke's Bay	4,376,120	2,759,951	1,586		1·23	Romney
Taranaki	973,028	1,377,106	707	97·00	24·49	Romney
Wellington	6,969,334	5,191,195	1,343		3·32	Romney
Marlborough	1,019,344	2,415,155	422		1·38	Half-bred and Merino
Nelson	415,467	1,122,827	370	83·97	8·11	Romney
Westland	73,149	906,581	81		18·80	Romney
Canterbury	5,459,268	7,794,971	700	94·09	1·19	Half-bred and Corriedale
Otago	4,082,528	8,477,798	482	102·38	0·91	Romney and Half-bred
Southland	3,675,142	3,054,575	1,203		1·45	Romney
Dominion Totals	33,856,558	43,253,908	783	95·64	5·51	Romney

TABLE 12—DISTRIBUTION OF BREEDS, 1950

Breed.	Stud Sheep.	Percentage.	Sheep of Distinctive Breed.	Percentage.	Total.	Total Percentage.
Southdown	182,560	0·54	302,413	0·89	484,973	1·43
Romney	295,781	0·87	6,429,839	18·99	6,725,620	19·86
Border Leicester	13,019	0·04	23,579	0·07	36,598	0·11
English Leicester	4,393	0·01	3,198	0·01	7,591	0·02
Shropshire	542	.....	769	.....	1,311	.....
Lincoln	2,937	0·01	2,712	0·01	5,649	0·02
Merino	25,290	0·08	777,392	2·30	802,682	2·38
Corriedale	42,536	0·13	1,083,213	3·20	1,125,749	3·33
Ryeland	4,835	0·01	8,389	0·02	13,224	0·03
Other breeds	10,931	0·03	24,441	0·07	35,372	0·10
Half-bred	.....	.....	1,880,978	5·56	1,880,978	5·56
Crossbreds and others not otherwise enumerated	.....	.....	.....	.....	22,736,811	67·16
Totals	582,824	1·72	10,536,923	31·12	33,856,558	100·00

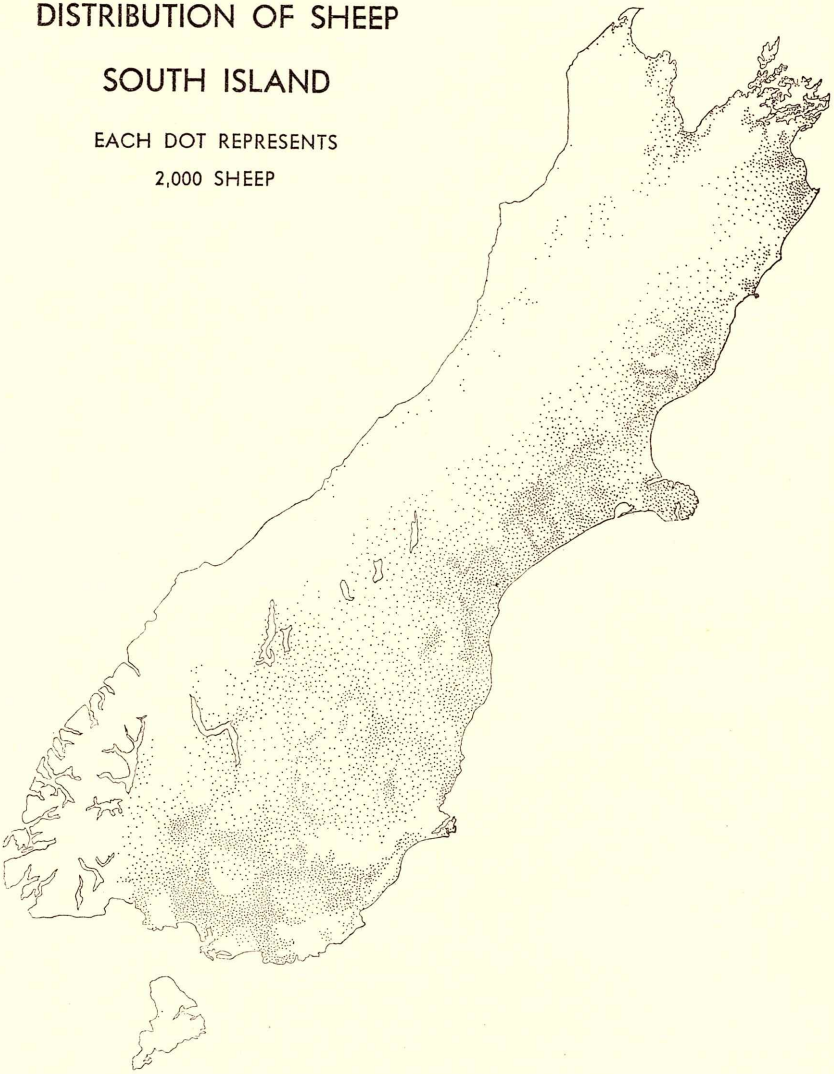
The sheep included under "Other breeds" comprise mostly such types as Cheviot, Suffolk, Dorset Horn, &c., but they are very much in the minority and are of no economic importance at present.

The salient feature of the above table is the important part played by the Romney in New Zealand to-day, constituting as it does 18 per cent of the flocks as a recognized breed and being at the same time the predominating strain in the 69 per cent of the Dominion's sheep, which are crossbreds.

DISTRIBUTION OF SHEEP

SOUTH ISLAND

EACH DOT REPRESENTS
2,000 SHEEP



Map prepared by Dr. W. M. Hamilton, Department of Scientific and Industrial Research.

Table 13 completes the picture by giving the proportions of the different classes of sheep.

TABLE 13—SHEEP POPULATION

Year.	STUD SHEEP.				
	Rams.	Breeding-ewes.	Dry Ewes.	Lambs.	Total Stud Sheep.
1900	7,985	182,255	15,047	123,145	328,432
1905	8,333	192,364	10,776	120,649	332,122
1910	15,068	227,187	13,943	160,236	416,434
1915	16,066	237,201	17,298	175,861	446,426
1920	13,545	154,376	9,733	109,347	287,001
1925	12,400	184,744	7,867	131,485	336,496
1930	14,248	244,480	7,884	174,862	441,474
1935	11,249	231,605	7,292	169,041	419,187
1940	12,273	262,467	5,939	188,556	469,235
1945	13,436	309,447	6,230	223,491	552,604
1950	12,129	319,077	6,249	245,369	582,824

Year.	OTHER SHEEP.					
	Rams.	Wethers.	Breeding-ewes.	Dry Ewes.	Lambs.	Grand Total Stud and Flock Sheep.
1900	189,945	3,528,799	9,074,799	1,079,524	5,153,696	19,355,195
1905	220,773	2,771,872	9,886,820	698,512	5,220,686	19,130,785
1910	290,501	3,167,082	12,288,193	1,194,570	6,912,842	24,269,622
1915	298,395	3,258,478	12,341,624	1,361,979	7,117,492	24,824,394
1920	293,038	3,901,175	11,414,173	1,812,551	6,206,568	23,914,506
1925	343,179	3,063,663	13,530,479	875,889	6,398,239	24,547,955
1930	434,369	3,367,916	17,319,695	1,069,788	8,208,045	30,841,287
1935	459,821	2,481,354	17,580,812	980,773	7,154,807	29,076,754
1940	528,847	2,434,586	19,465,190	959,611	7,205,406	31,062,875
1945	546,233	2,525,788	20,556,411	911,915	8,881,661	33,974,612
1950	582,553	2,476,259	21,562,390	637,171	8,015,361	33,856,558

The table shows that the number and proportion of breeding-ewes have been steadily increasing, due in the main to more intensive farming methods, greater use of fertilizers, and better pastures. This is important, because the higher this proportion the more profitable is the flock likely to be, and also because, with a high proportion of breeding-ewes, the powers of recuperation or deliberate increase of the flock are enhanced.

SYSTEMS OF SHEEP-FARMING

New Zealand has a great diversity of types of sheep-farms, ranging from those which produce wool as practically their sole product to those which are capable of fattening for sale all stock carried. Between these are many intermediate gradations, and as the Dominion covers a fair range of latitude (approximately 1,000 miles from north to south) and as topographical features and efficiency of management also vary considerably, it is possible to find very many individual differences even between adjacent farms. For the sake of simplicity and brevity, it is proposed to make an arbitrary classification into five groups:—

(*a*) High hill-country farms.
(*b*) Lower hill-country farms.
(*c*) Fattening farms.
(*d*) Intermediate types.
(*e*) Stud farms.

(a) High Hill-country Farms

High hill-country farms are mainly to be found in the South Island, where they cover a considerable area, 10 million acres approximately, but carry an average of perhaps one sheep to every 4 acres. This low carrying capacity is due to the steepness and generally low fertility of this type of country, which is in the main a belt running along the eastern slopes of the Southern Alps and covered principally with native tussock grasses. In this area rabbits and erosion are problems, and heavy snowfalls cause high mortality among the flocks periodically. On the higher sections of this region Merinos are the only sheep which can cope with the rigorous conditions. A habit peculiar to the breed is to climb to the highest peaks and feed systematically down to lower levels. The habit has a distinct value, because it means that the sheep have eaten out the tops by the time they have to be moved to lower country before the heavy snowfalls arrive.

The high-country farmer derives almost all his income from wool and for this reason pays much attention to the selection of rams and the classing of his clip. He aims to carry as high a proportion of wethers in his flock as possible, because wethers are more hardy and produce a heavier and better fleece than breeding-ewes. The latter are kept in just sufficient numbers to breed the necessary flock replacements, and little surplus store stock is available for sale. After a heavy snow loss it may take years to rebuild the flock to its original level, as lambing percentages on this class of country are very low. On some of the easier portions half-bred sheep are run, usually a Lincoln-Merino or a Leicester-Merino cross. From these there will be a small number of store stock available for disposal each year, mainly to other high-country runs.

High hill-country farming is highly specialized and bears very little relationship to other types of sheep-farming. The permanent staff employed on a high-country run is small and the handling of the sheep kept to the minimum. In the North Island this type of farming is confined to two small areas: on the high central plateau and on some of the high back country in the Hawke's Bay–Poverty Bay area.

(b) Lower Hill-country Farms

Lower hill-country farms form a very important section of sheep-farming in both North and South Islands because of the large aggregate area they cover and because they are the source of supply of stock to the low-country fattening farms. It is impossible to give an accurate figure for the area involved, as there is no clear demarcation between lower hill-country farms and fattening farms, but together the two groups probably account for at least 20 million acres. On the hill-country farms climate, topography, and natural fertility vary widely, but on an average this class of country carries between one and two sheep to the acre.

In the North Island most of this land was originally covered in bush (forest), which was felled and afterward burnt. Usually blackened logs and stumps remained for years, but the initial fertility of the soil, owing to the liberal coating of ash, was high, and good strikes of surface-sown grass were obtained. Later a gradual decline in fertility and carrying capacity set in on most of this country, with a good deal of trouble from slips and erosion on the steeper areas. On other portions the encroachment of scrub, fern, and second growth was relatively rapid where this was not rigorously kept in check. In the past it was not possible to carry out much top-dressing on most of these farms, because of physical and economic problems due to the steepness of the land and difficulty of access. Recently the scope for top-dressing has been widened by the development of aerial top-dressing and the use of other forms of mechanization, such as the blower, which blows fertilizer up steep slopes and relies partly on air currents to effect even distribution, and the track-laying tractor, which can cut access tracks to enable fertilizer to be hauled to hilltops and shut-in valleys.

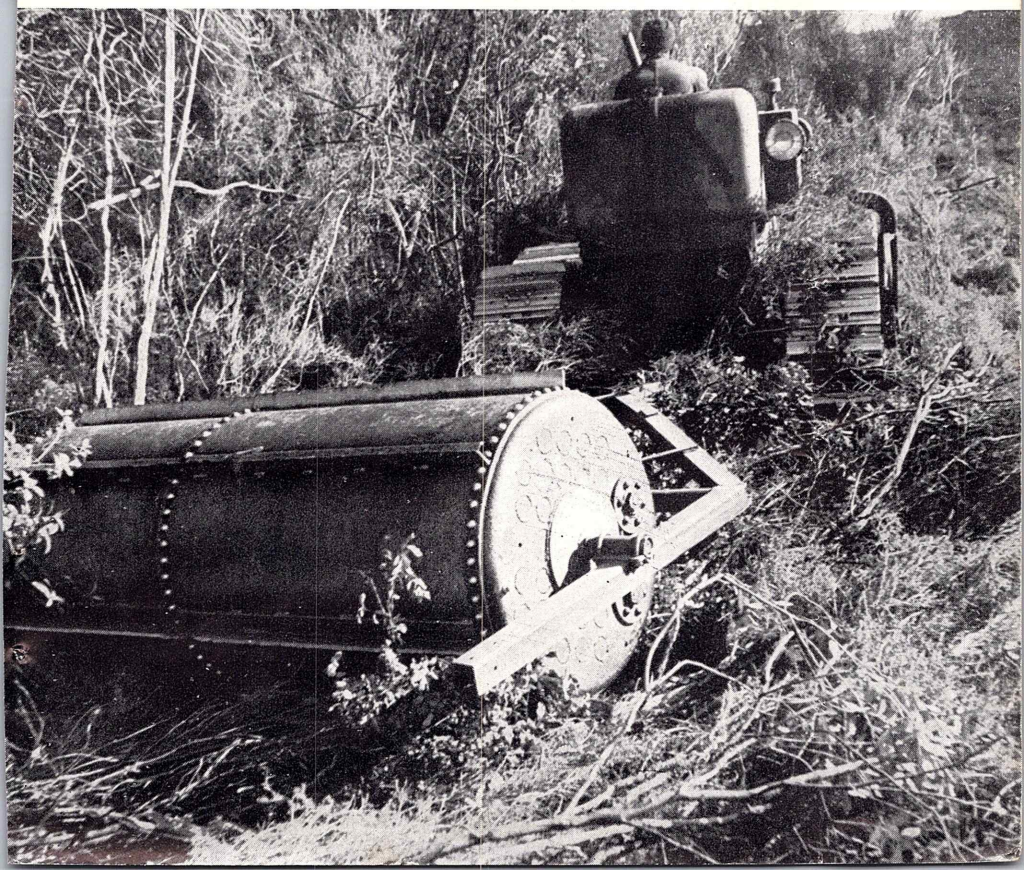
Better produce prices have enabled farmers to take advantage of these techniques, and the improvement of New Zealand's marginal hill country should continue at a progressively increasing rate, provided that satisfactory returns continue to be received for meat and wool.

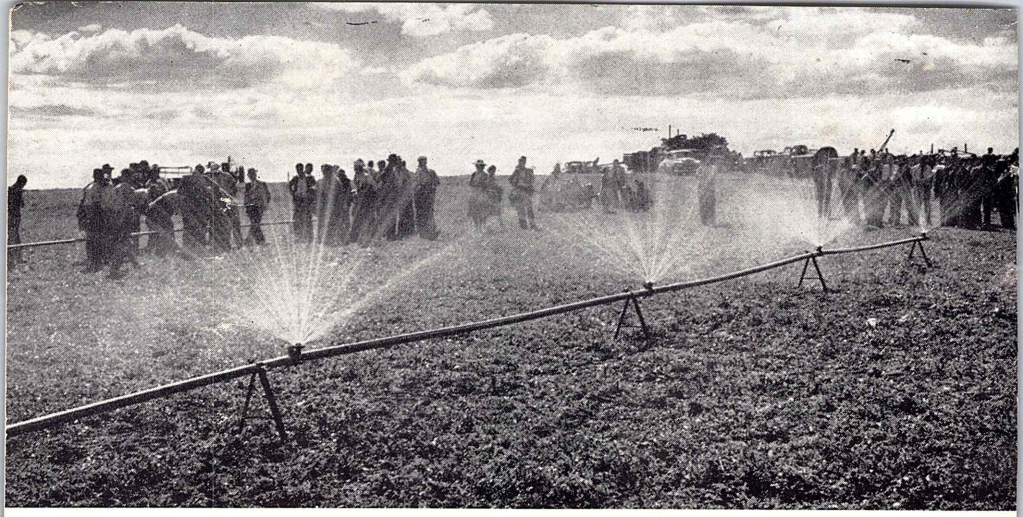
Top-dressing with fertilizers and lime is a routine practice associated with grassland farming in New Zealand. Above—Rotary-type top-dressers, fitted to trucks or tractor-drawn trailers, are used widely. Below—By use in recent years of the aeroplane it has been possible to extend the scope of top-dressing to areas which previously could be dressed only by carrying in fertilizer on packhorses and distributing it by hand.

[*Wade Studios photo.*

Land development with heavy machinery. Above—Using giant disks on steep country. Below—Rolling land to prepare a seed-bed for pasture. The land shown is part of an extensive area of pumice country developed in the central part of the North Island by the State. Above opposite—Ploughing scrub-covered sand country with a giant swamp plough. Below opposite—Heavy roller used for crushing scrub, a preparatory stage in the breaking in of scrub land.

[*Photos below and below opposite by "New Zealand Farmer".*





Above—In the main dairying districts considerable interest is now being taken in overhead spray irrigation to offset drying up of pastures. Portable equipment such as that shown being demonstrated to farmers is being used. Below—In parts of New Zealand liming of pastures has had a considerable influence on production. A recent trend has been bulk distribution of ground limestone by contractors operating heavy trucks, who load the lime from stockpiles or at lime-works and spread it on the farms.

[*Sparrow Industrial Pictures, Ltd., photos.*

In the North Island the sheep carried are almost invariably cross-breds, with a higher proportion of breeding-ewes on the better areas, and more wethers, dry sheep, and cattle on the poorer sections. Cattle are employed as the only practical method for crushing and eating off the roughage, fern, &c., which is left by the sheep and would otherwise increase rapidly. Cattle are regarded really as agricultural implements and the farmer does not expect to make much profit from them. The common types are Aberdeen Angus, Hereford, and crosses of these breeds. They are usually bred on the property.

The stock carried consists of rams, breeding-ewes, ewe hoggets (for replacements), and a varying proportion of wethers, according to the class of country. Rams are the only stock bought in, and the farmer pays careful attention to their wool and constitution, both of which influence his returns. The products of this type of farm are wool, some store lambs, and a few fat wether lambs, some cull hoggets, and a varying proportion of store or fat wethers and store cattle, and an annual draft of cast-for-age ewes. These ewes are in ready demand on the fattening farms, where they are used for another year or two for mating with Southdown rams for fat-lamb production. As the farm is self-supporting for everything but rams, a careful policy of selection and culling of ewes must be followed if the general quality of the stock is to be maintained or improved. The ewes are culled at the two-tooth stage on their wool, and the following season as four-tooths in the light of their breeding performance. In general, little or nothing in the way of supplementary crops for winter feeding is grown on this type of farm.

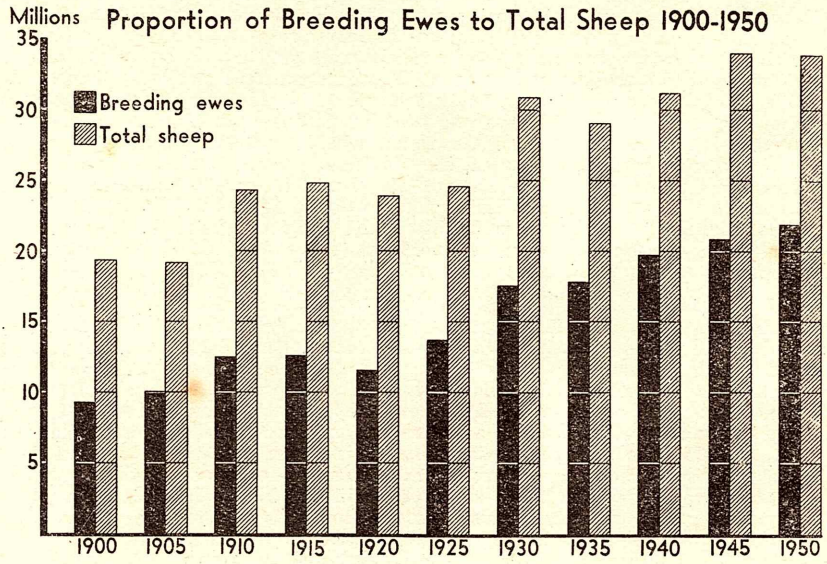
The corresponding type of property in the South Island differs in a number of ways. In the first place it was probably developed from native tussock areas instead of standing bush, and in general the rainfall is a good deal lighter than in the North Island. The type of sheep run is usually either half-bred or Corriedale, with a proportion of three-quarter-bred on the lower country. Pastures tend to deteriorate and are of a temporary nature. Paddocks are ploughed up at intervals, a crop taken off, and the area then resown in grass. This fits in with the necessity for providing special crops, such as swedes or turnips, for winter feed, because winters are longer and more severe than in the North Island. Few, if any, cattle are carried, because second growth is not such a problem, but in some areas rabbits are troublesome and have to be constantly kept in check. The general principles of stocking and the disposal of products are similar to those of the North Island properties.

(c) Fattening Farms

Fattening farms are on land of high fertility, either natural or induced by top-dressing, and may be used either for fattening stock or for dairying, according to preference or to the net returns from the different products. The country is generally low-lying, varying fom flat to undulating. Climate varies from relatively warm and moist in parts of the North Island to fairly cold and dry in the South Island. This influences the type of feed produced, for in the North Island it is common to rely almost entirely on grass from improved pastures sown in English grasses and clovers and regularly top-dressed, while in the South Island it is essential to grow special crops for fattening. The average range in carrying capacity is from three to six sheep an acre.

Ewes are nearly always bought in and sold again fat after producing lambs for one season, or in some cases two. In the North Island the cast-for-age (or in some cases younger) ewes from hill-country farms are bought by private treaty or, more commonly, at the annual ewe fairs in January and February. Rams may be acquired by similar methods. Crossbred (predominantly Romney) ewes are almost invariably run, and though other crosses with Suffolks, Ryelands, Dorset Horns, &c., have been tried, ewes are now nearly always mated with Southdown rams. The result is

the most acceptable type of lamb carcass, which reaches finished and well-balanced proportions at an early age and at light weights. Where possible lambs are milk-fattened, but occasionally a crop such as rape is grown to fatten off lambs which cannot be got away fat off their mothers. The extra flush of spring grass growth is often controlled by cattle, which are also fattened, and if of suitable type these can be disposed of in the autumn for chilled beef, the most profitable way to quit them. On some properties wethers may also be bought in and fattened for sale. Lambing percentages are usually high, averaging in the vicinity of 110 to 120 per cent, and lambs are mainly sold on the farm to representatives of the meat-export companies.



In the South Island conditions in every way are a good deal more varied. In some areas prolonged dry spells make irrigation and the provision of special crops, such as lucerne, necessary. The ewes available from the hill country are also more mixed in type, and may be of Merino, half-bred, Corriedale, crossbred, or three-quarter-bred strains. Any or all of these types may be found in certain areas, such as parts of Canterbury. The choice of ram also varies. The English Leicester was the first choice and the sire of the original Canterbury lamb, but to-day the Southdown tends to replace it, particularly for crossing with the coarser-woolled ewes. In Southland the Border Leicester is also popular.

Considerable areas of special crops such as rape have to be grown for fattening lambs, and roots, hay, chaff, &c., have to be provided for winter feed for the ewes. On some properties wethers and/or cattle may be bought for fattening, but this practice is not as common as in the North Island. In general, lambing percentages are lower than in the North Island, and on the whole lines of fat lambs produced are not so even or so valuable, pound for pound, as in the North Island.

(d) Intermediate Types

There are various intermediate gradations in the types of sheep-farms and in some cases a large holding may combine hill country and lower, fattening land in the one self-contained unit. Sheep are also found

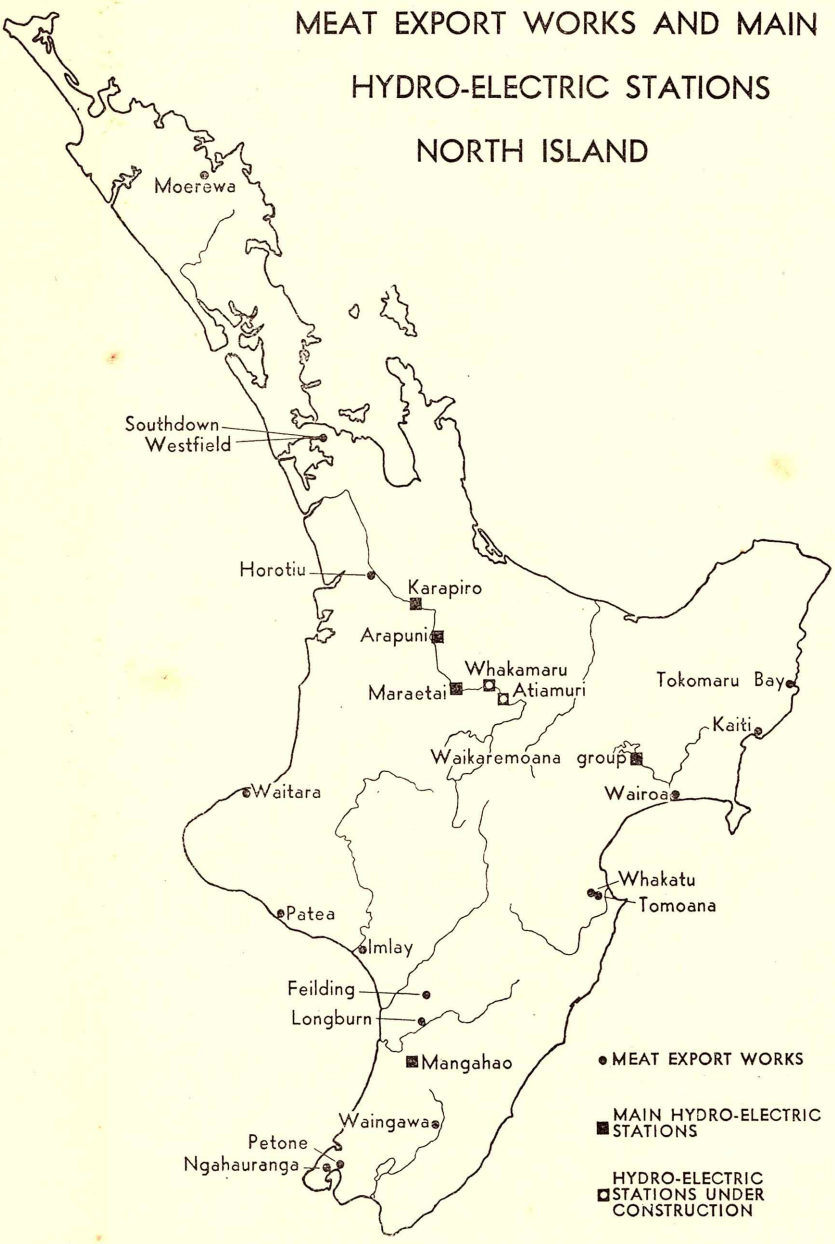
on dairy-farms, where it is frequently the practice to buy in-lamb ewes or cull lambs and hoggets, or both, to act as followers to the dairy herd. These sheep usually do very well under the conditions obtaining on the typical dairy-farm. On other farms, where only a portion of the area is suitable for cows, sheep may provide quite an important contribution to the income. To a small extent in the North Island, and quite frequently in the South Island, sheep are bought in and fattened on arable farms, where feed crops such as swedes and rape are often included in the crop rotation. There are no recent figures available on the area of these mixed farms, but for the year 1929–30 mixed dairying and sheep farming represented 7 per cent and mixed agricultural and sheep farming 5 per cent of the total area of occupied holdings of the Dominion. It is certain that since these figures were compiled the percentage of mixed dairying and sheep farms must have increased, but it is impossible to say by how much. There is not likely to have been any great alteration in the second group.

(e) Stud Farms

Although the total of stud farms is neither large in area nor in number, the farms are nevertheless of great importance to the industry, for the stud farm is the fountain head for the supply of rams, and improvements in quality at this point are transmitted over a period through most other flocks. Stud farms are highly specialized and are nearly always situated on first-class land. One reason is that only with the best environment and nutrition can an animal develop to the full its inherited qualities. This situation is not an unmixed blessing, as many rams have to go straight from these almost pampered conditions to hard hill country.

The stud breeder has several markets for his sheep. New Zealand has quite a valuable export trade in high-quality stud sheep. Stock have been sent to every major sheep-farming country in the world and have brought, on an average, very satisfactory prices. The top stud masters sell high-quality rams to other stud breeders, and a few direct to hill sheep-stations. All stud breeders sell flock rams as an important section of their business, although it does not follow that all rams used on the country's flocks are registered studs. In fact, most rams used probably come under the category, "sheep of a distinctive breed but not entered in Flock Book"—see Table 12. This table also gives the proportion of the different breeds in stud flocks to-day. As it appears that the most promising avenue for the improvement of flocks in the future lies in the use of better rams, intelligently used, stud stock farms have a great opportunity and a great responsibility.

In Great Britain there are nearly forty distinctive breeds of sheep which have been evolved, many of them over a long period, to meet particular local conditions. In New Zealand, on the other hand, there are fewer than a dozen breeds which play an important part in sheep-farming economy (see Table 12). It may be said that in the North Island only two breeds, the Romney and the Southdown, are of major importance, and of these the Romney is distributed over a surprisingly wide range of topographical and climatic conditions. It is not surprising, therefore, that there are to-day not only a number of distinct types within the breed, but also that the breed as a whole has diverged considerably from its English Romney Marsh prototype. The modern New Zealand Romney is lower set, lighter boned, and better fleeced than its English counterpart. In general in New Zealand the British breeds have been deliberately developed along rather different lines from the stud flocks of Britain, the main differences apparent to-day being that the Dominion's sheep are lower set and have more even and denser fleeces. It is considered by some that in the long-run New Zealand might be well advised to employ a greater variety of breeds to suit her widely varying conditions, as Britain has done, rather than to concentrate as at present on virtually a single breed.


MEAT EXPORT WORKS AND MAIN
HYDRO-ELECTRIC STATIONS
NORTH ISLAND
Moerewa
Southdown
Westfield
Horotiu
Karapiro
Arapuni
Whakamaru
Maraetai
Atiamuri
Tokomaru Bay
Kaiti
Waikaremoana group
Waitara
Wairoa
Whakatu
Tomoana
Patea
Ilmlay
Feilding
Longburn
Mangahao
Waingawa
Petone
Ngahauranga
MEAT EXPORT WORKS
MAIN HYDRO-ELECTRIC STATIONS
HYDRO-ELECTRIC STATIONS UNDER CONSTRUCTION

PRODUCTION OF MEAT

Lamb and Mutton: Although the percentage exported of total production of meat is low when compared with wool, cheese, or butter, the industry is of vital importance to New Zealand's whole farming economy. It has been explained in the section "The Importance of Machinery in Agricultural Development" how the application of refrigeration to transport was chiefly responsible for the expansion of sheep-farming, because it would never have been economic to graze sheep on the better-quality land for the production of wool alone.

Similarly, beef production is principally a by-product of sheep-farming. Many sheep-farmers, especially in the extensive pastoral region, run a relatively small number of beef cattle to graze off surplus rough grass and fern. On the better farms these cattle are fattened, but where this cannot be done they are sold as stores to farmers on the better-quality sown pasture lands for finishing off.

Between 1947–48 and 1949–50 New Zealand's total production of meat increased from 549,100 long tons to 577,400 long tons. Of this, over 300,000 tons was lamb and mutton, and the sheep industry contributed the greater part of the 21,000 tons of edible offals and by-products such as pelts, skins, tallow, sausage casings, meat meal, and blood and bone fertilizers which the meat industry as a whole produces.

Both on a weight and a value basis lamb leads all other types and classes of meat. Killings in recent years average between 11 and 12½ million, representing about 195,000 tons of meat. Fat-lamb farming is carried out on the better type of country, the main source of feed for lambs being the mother's milk, although, fairly early in life, lambs begin to nibble the protein-rich grass and clover on which their mothers graze. Growth is necessarily rapid and most of the lambs are sold at about 30 lb. to 36 lb. In Canterbury, fattening practice differs somewhat. There, lambs are purchased from the hill-country farmers and fattened on crops such as rape, turnips, and kale. Such lambs attain weights above the average. Prices per pound, however, are higher for the lighter lambs, decreasing progressively for higher weights.

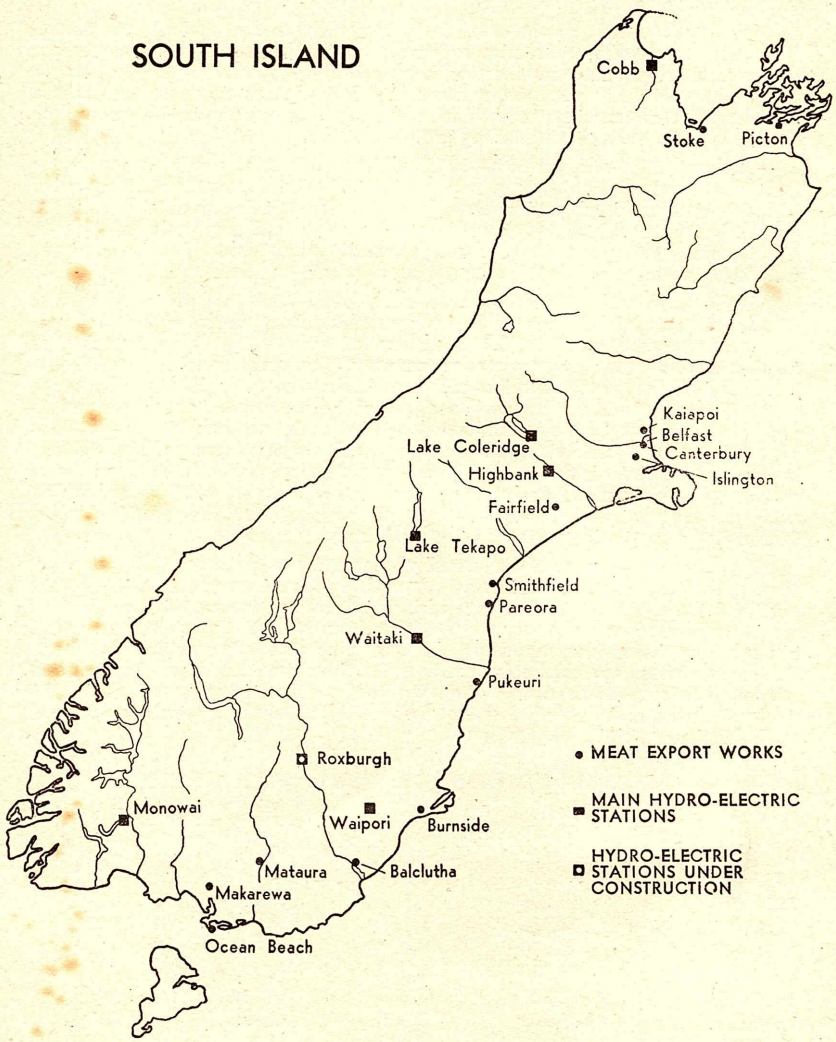
Wether and ewe mutton usually amounts to between 120 and 130 thousand tons, the total killings of both types ranging from 4½ to 5¼ million. The exact number of each type is not accurately known, as statistics collected from rural slaughterhouses and from farmers (of killings for home consumption) do not give the appropriate break-up. Of recent years considerably more ewes than wethers have been killed for export, but for local consumption the position is reversed. For the twelve months ended 30 September 1950 772,750 wethers were slaughtered at abattoirs, against 119,100 ewes.

TABLE 14—EXPORTS OF MUTTON AND LAMB

	Mutton. (Ewes and Wethers) (Tons).	Value £(N.Z.) (Thousands).	Lamb (Tons).	Value £(N.Z.) (Thousands).
1929–30	51,057	2,042	100,335	6,885
1934–35	52,196	1,905	139,801	8,832
1939–40	78,916	2,717	157,608	10,821
1944–45*	92,230	3,272	201,790	14,578
1946–47†	83,660	4,197	174,147	16,994
1947–48†	71,367	3,859	185,704	19,195
1948–49†	71,449	3,801	199,033	18,746
1949–50†	49,893	2,905	164,059	16,039

* Figures for 1944–45 were exceptionally high because larger quantities of meat were shipped, there being greater shipping space available. † Provisional.

MEAT EXPORT WORKS AND MAIN HYDRO-ELECTRIC STATIONS



The outstanding feature of mutton and lamb production has been the rapid development of the fat-lamb industry. Lamb has now become one of New Zealand's principal exports, third in value to butter and wool only. The comparatively recent development of this industry is illustrated by Table 14—exports of lamb and mutton for years ended 30 June.

Beef and Veal: There are only a limited number of farmers who concentrate entirely on beef production, the main reason being the much higher net return from other types of farming on land of the type and quality necessary for fattening cattle. Much of New Zealand's beef and veal is a by-product of other farming, especially sheep-farming, though considerable quantities of cow and heifer beef and all "bobby" calf (week-old calves) veal are a by-product from dairying.

Cattle used to clean up rough pasture growth and fern and sold as stores to farmers on the better-quality land for fattening do not grow into first-class beef and the expansion of New Zealand's overseas beef trade depends on breeds being raised on farms where they can be well fed from birth.

Beef killing for the past seven years (ending 30 September), including condemnations, were as follows:—

1943–44.	1944–45.	1945–46.	1946–47.	1947–48.	1948–49.	1949–50.
632,000	672,000	694,000	728,000	712,000	662,000	693,000

In addition, over 1,000,000 calves are killed annually, all but 70,000 of these being "bobby" calves from dairy-farms.

Only a fairly small proportion of beef slaughterings are bullocks. For 1950 the respective figures were:—

Cows.	Bullocks.	Heifers.	Bulls.	Total.
331,847	226,496	107,427	26,989	692,759

An important development in the meat industry took place in 1933 when the Meat Producers Board arranged two trial shipments of chilled beef to the United Kingdom markets. From then on to the outbreak of the Second World War regular shipments were forwarded with promising results. For the years 1936–37 to 1938–39 shipments were arranged for more than 200,000 quarters per annum. Nevertheless, when the outbreak of war interrupted the trade, the export of chilled beef was still in the experimental stages and New Zealand's product was still below the standard necessary to enable it to compete with Argentina.

The future of the chilled-beef trade is at present very uncertain and prospects depend on the return to normal trading conditions in the meat industry in Britain.

Pig Meat: Pig meat production in New Zealand is almost entirely a by-product of dairying. In 1949–50 71 per cent of the total pig poplation was in the three land districts of North Auckland, Auckland, and Taranaki —the main dairying areas. That is because the main feedstuff for pigs is separated milk, although in cheese-producing areas whey is also used. To obtain the most satisfactory results, however, it is necessary to supplement separated milk (still more in the case of whey) with a grain or meal.

Many farmers use pastures for pig feed, the piggery being subdivided somewhat similarly to the dairy-farm itself. Store pigs thrive reasonably well on good-quality pasture supplemented with a little milk and meal or roots and can be fattened when sufficient milk becomes available or sold to other farmers for fattening.

The development of the pig industry has been closely parallel with that of the dairy industry. This is illustrated by the following table showing sow numbers and numbers of cows in milk.

TABLE 15—COWS IN MILK AND SOWS

	Cows in Milk.	Sows.
1920	782,757	38,986
1925	1,195,567	60,462
1930	1,388,872	61,706
1935	1,827,962	111,793
1940	1,739,874	92,749
1945	1,699,528	77,932
1947	1,678,275	68,668
1950	1,866,095	74,842

Table 16 shows slaughterings of pigs for years ended 30 September:—

TABLE 16—SLAUGHTERING OF PIGS

1936–37	1,122,204	1943–44	726,595
1937–38	1,091,789	1944–45	674,243
1938–39	962,657	1945–46	655,713
1939–40	872,091	1946–47	633,334
1940–41	1,004,689	1947–48	637,715
1941–42	926,042	1948–49	674,263
1942–43	766,850	1949–50	676,000*

* Preliminary.

Production of ham and bacon between 1938 and 1950 was as follows (figures from the Census and Statistics Department's Factory Production):—

TABLE 17—PRODUCTION OF HAM AND BACON

	Cwt.		Cwt.
1938–39	164,259	1944–45	434,546
1939–40	181,350	1945–46	400,980
1940–41	199,465	1946–47	305,260
1941–42	212,770	1947–48	282,000
1942–43	325,570	1948–49	283,280
1943–44	417,203	1949–50	300,660

Since 1947 there has been an increase in the amount of dairy by-products available for pig feeding, but because of shortage of labour and economic conditions generally, pig production has shown little response. The considerable increase in the manufacture of processed milk products has also affected pig production.

An account of the activities of the National Pig Industry Council appears in the section on producer organizations (see pages 142–143).

METHODS OF SALE

Meat-export Slaughterhouses: Meat intended for export from New Zealand is slaughtered at meat export slaughterhouses, of which thirty-eight are at present operating in the Dominion (see maps pages 36 and 38). They are licensed, subject to the provisions of the Meat Act 1939 and regulations, and licences must be renewed annually. These meat-works are principally designed for the slaughter of sheep and lambs and also have facilities for killing beef, which are sometimes on a large scale. Many also have extensive pig-killing plants, and there are several meat export slaughterhouses which deal with pigs only.

The design, facilities, and sanitary arrangements at New Zealand meat-export slaughterhouses are efficient and up to date, as also are the facilities for the handling, yarding, and slaughtering of stock, and improvements are constantly being carried out. The mutton and slaughtering departments are situated on the upper floors, where edible products are also dealt with. From the slaughter floor mutton and lamb carcasses pass to the cooling-rooms, finally entering the freezing-chambers.

Ample refrigerated storage space, usually sufficient to store at least one season's killing of all classes of stock, is available at most meat-export slaughterhouses. Many works have up-to-date canning plants.

In some cases the local town authority has delegated its abattoir authority, as it may under the Meat Act 1939, to a meat-export slaughterhouse. Where this is done, all meat for local consumption is also killed at a meat-works.

In the North Island the slaughtering season commences in October and usually terminates about the end of May in the following year. The South Island season is a month later.

Stock is usually bought from the farmer, either direct by the freezing companies or by agents of meat-export houses, who, in any case, kill and export through the freezing companies. The farmer may also export his meat on his own account through the freezing company, but very few farmers choose this method. The stock-buyers operate at local stock sales, where they buy at so-much per head on the hoof, and also on farms, where they buy at schedule rates of so-much per pound, the farmer being paid on the killing weights at the works. Where buying is done on the farm the owner calls in the buyer when he thinks a good percentage of his lambs are ready for killing. The buyer goes through the lambs, selects those which are in prime condition, and these go away on the first draft. Other drafts are picked at intervals as the lambs fatten, the aim being, of course, to get as many as possible away fat. Lambs which are not ready for killing by March or April are carried over and in some cases fattened on special feed. With ewes the problem is rather to prevent them from becoming too fat, and the cull ewes are usually sent to the works soon after their lambs.

Beef is dealt in much more through weekly stock markets than other kinds of stock. This is partly because a larger proportion of it is consumed in the local market than is the case with sheep or pigs. For that reason prices for beef vary very much more from week to week than those for other fat stock. A good deal of beef supplied comprises culled dairy cows and heifers and is consequently not of the best quality. Prices for this class of beef are very sensitive to market changes. An interesting development in the marketing of beef of this type is the institution of co-operative collecting and marketing schemes by Federated Farmers. Besides ironing out stock sale price irregularities, this system eliminates a fairly large proportion of the handling charges and is giving farmers a much higher net return.

Bacon pigs are sold both in saleyards, under the system of competitive bidding by buyers of the various large meat-works, and also direct to the works (known as selling over the hooks), when each pig is paid for at so-much a pound. The return is rather higher by the latter method (for one thing, the auctioneer's commission is eliminated), but the seller takes some risk in that his pigs may be condemned wholly or in part. A system of insurance, however, helps to cover this.

Most porkers (pigs weighing from 60–80 lb.) are sold in the saleyards, although a few of these, too, are put over the hooks. Weekly sales, incidentally, also provide a valuable service in the selling of all other types of pigs from weaners a few weeks old to aged sows and boars classified as choppers and destined largely for the boiling-down works.

In the pig industry, too, co-operative marketing organizations have for some years been purchasing farmers' fat pigs, more particularly baconers, and putting them through the meat-works in the usual way, but on a non-profit-making basis. The original prices are generally about the same or perhaps a litttle less than those ruling at the time of sale, but at the end of the season a further payment is made according to whatever profits remain in hand.

A similar system now obtains with regard to the sale of "bobby" calves.

Abattoirs: Abattoirs kill all the meat required by the urban centres and large provincial towns. There are at present forty-three abattoirs in New Zealand, the larger ones being organized on the same lines as the meat-export works. At abattoirs and, of course, at meat-export works, all meat is inspected in order to ensure that no diseased meat is sold for consumption. This is decribed more fully later in this chapter.

Rural Slaughterhouses: Rural slaughterhouses kill meat for consumption in small country towns and rural districts. Though there is no regular inspection of meat at these slaughterhouses, they are liable to fairly frequent visits from Stock Inspectors of the Department of Agriculture, who check up on slaughterhouse building regulations, methods of killing, and disposal of refuse, &c.

Farm Killings: Many farmers, particularly on sheep-farms, kill their own meat. In fact, as will be seen from the table on page 43, many more sheep are killed on farms than at rural slaughterhouses, but very few beef cattle or pigs are killed on farms.

GRADING OF MEAT

The supervision of grading of meat for export is one of the responsibilities of the New Zealand Meat Producers Board. Grading at each freezing-works is carried out after slaughtering and dressing by graders employed by the concern operating the freezing-works. Supervising graders of the New Zealand Meat Producers Board are allotted to each group of works, which ensures uniformity of grading.

The various grades for export, under normal trading conditions are:—

Mutton

Prime Wethers and Maiden Ewes: In weight ranges of up to 48 lb., 49–56 lb., 57–64 lb., 65–72 lb., 73–80 lb., and 81 lb. and over.

Second-quality Wethers and Maiden Ewes: Optionally in weight ranges of up to 56 lb. and 57 lb. and over.

Ewes: In the same six weight ranges as prime wethers and maiden ewes.

Lamb

Prime Lamb: In weight ranges of 28–36 lb., 37–42 lb., 43–50 lb., and 51–56 lb.

Second-quality Lambs: Optionally in weight ranges of up to 36 lb. and 37 lb. and over.

Beef

Prime Ox Beef ("G.A.Q." or good average quality): In weight ranges of quarters of 160 lb. or under, 161–180 lb., 181–200 lb., and 201 lb. and over.

Second-quality Ox Beef ("F.A.Q." or fair average quality).
Prime Heifer Beef.
Cow Beef.
Second-quality Cow Beef.

Veal

Prime Veal.
Second-quality Veal.

Pork

Prime Pork: In weight ranges of 60–80 lb., 81–99 lb., and 100–120 lb.
Prime Baconers: In weight ranges of 120–160 lb. and 161–180 lb.

Meat for Local Consumption

Grading of meat for local consumption is carried out by the meat-inspection staff of the Animal Industry Division of the Department of Agriculture. The different grades are as summarized below, and the

grade markings, which are placed lengthwise down the carcass in such a way that they show up on all joints after cutting up, are of the colours indicated.

Beef: First grade (red stripe), second grade (blue stripe), third grade (yellow stripe).

Veal: First grade (red stripe), second grade (blue stripe), boner grade (chocolate stripe).

Mutton: First grade (red stripe), second grade (blue stripe), third grade (yellow stripe), boner grade (chocolate stripe).

Lamb: First grade (broken red stripe), second grade (broken blue stripe).

Hogget: First grade (double red stripe).

Pork: First grade (red stripe), second grade (blue stripe), boner or chopper grade (chocolate stripe).

Table 18, showing killings for the year ended 30 September 1947, gives some idea of the quantities of stock slaughtered at the various types of slaughterhouses and abattoirs.

TABLE 18—SLAUGHTERINGS OF STOCK

——	Meat-export Works.	Abattoirs.	Rural Slaughter-houses.	Killed on Farms 31 January 1950.	Totals.
Cows	268,368	47,186	15,256	1,038	331,848
Bullocks	104,974	96,569	24,393	559	226,495
Heifers	26,481	52,682	28,264	.....	107,427
Bulls	25,974	1,010	5	.....	26,989
Total Cattle	425,797	197,447	67,918	1,597	692,759
Calves	1,232,453	41,122	764	808	1,275,147
Sheep	3,376,278	891,867	250,555	489,093	5,007,793
Lambs	12,560,310	158,828	17,898	51,473	12,788,509
Pigs	530,198	123,557	13,607	9,062	676,424

INSPECTION OF MEAT

One of the activities of the Animal Industry Division of the Department of Agriculture is to administer the Meat Act 1939 and regulations thereunder, and consequently all meat inspection in the Dominion, whether in connection with meat intended for export or for local consumption, is carried out by officers of the Division. For administrative purposes there are four districts, Auckland, Palmerston North, Christchurch and Dunedin. The staff in each district is under the control of a live-stock superintendent, who is a veterinarian and who is responsible to the Director of the Division for meat-inspection duties at meat-export slaughterhouses and abattoirs in his district. Veterinary officers are stationed at meat-works and are in charge of all inspection operations. In some instances the veterinary officer supervises a group of meat-works in a localized area. The veterinarian controls the lay meat-inspection staff and is responsible for the certification of all meat and meat products.

The staff of lay meat inspectors consists of about 270 officers. At each meat-export slaughterhouse a supervising meat inspector, who is responsible to the veterinarian in charge, is in immediate control of the meat-inspection staff.

Meat inspectors are selected for appointment from applicants who have had experience in meat-works and live-stock experience generally, coupled with a satisfactory standard of education. An assistant meat

inspector is required to serve two years before he is allowed to sit for the examination for certificate of competency. During this period he is required to undergo intensive training in all branches of meat inspection, receiving tuition from the supervising veterinarian, classes of instruction being held periodically to prepare the trainee for his examination. If successful in the examination, he receives an appointment to the permanent staff.

The syllabus of the examination for meat inspectors is fixed by regulations under the Meat Act, and includes a knowledge of the provisions of the Act and amendments, with the regulations thereunder; the anatomy and physiology of food animals; parasitology in its relation to meat inspection; the general principles of hygiene as applied to slaughtering places, including the proper methods and conditions under which stock intended for human consumption should be handled and treated before and after slaughter; the appearance of the various organs of the animal body in health and when diseased; diseases and conditions rendering the flesh of stock unfit for human consumption; a knowledge of the imported food regulations, and the requirements of the importing countries in regard to imported meats. The examination consists of written and oral sections, the latter being conducted as a practical test in the slaughterhouse.

An important function of the meat-inspection staff at meat-export works and abattoirs is to assist the field officers of the Animal Industry Division in the prevention and control of diseases of stock both by notifying disease incidences in lines of stock killed, so that owners can be informed and control measures discussed with them, and by obtaining, when required to do so, various types of specimens from stock at slaughter, for laboratory examination.

SYSTEM OF MEAT INSPECTION

The method of inspection followed is that laid down in the Meat Regulations 1940. The system is devised to ensure, as far as possible, freedom from disease in all meat and meat products and to maintain supervision over all stages of preparation of meat, meat products, and by-products.

The standard of inspection exercised in examination of carcass beef is extended in exactly similar manner to boneless beef.

It does not appear to be necessary to detail here the routine examination of the various parts of the carcass and organs, with incision of lymphatic glands, &c. Extracts from the regulations are:—

Regulation 8—Ante-mortem Inspection

"1. Ante-mortem inspection of all kinds of stock shall include: (*a*) Examination of the loading bank and yards of any abattoir or meat-export slaughterhouse for dead or dying animals; (*b*) examination for any evidence of cruelty to animals by over-trucking, over-driving, or by any other act; (*c*) examination for the detection of animals in an emaciated condition or affected with disease in any form.

"2. No person shall slaughter or cause or permit to be slaughtered for human consumption in any slaughtering-place any stock in a febrile condition.

"3. Unless with the specific authority of the inspector, no person shall in any abattoir or meat-export slaughterhouse slaughter or cause or permit to be slaughtered any stock showing ante-mortem symptoms of disease until all other stock intended to be slaughtered at the abattoir or meat-export slaughterhouse, as the case may be, on the same day have been slaughtered.

"4. All cases where in the opinion of the inspector, there is evidence of cruelty to stock shall be reported by the inspector, either orally or in writing to the manager of the abattoir or licensee of the meat-export slaughterhouse, as the case may be, and in writing to the supervising officer of the Live-stock Division of the Department."

Regulation 9—Post-mortem Inspection

"1. The carcass of any stock slaughtered for human consumption in an abattoir or meat-export slaughterhouse shall be thoroughly inspected by the Inspector, who shall, upon being satisfied that such carcass should be passed as fit for human consumption, cause the same to be dealt with in accordance with section 44 of the said Act.

"2. No person shall dress, or cause or permit to be dressed, any carcass without removing the skin unless the skin has been thoroughly washed and cleaned before the carcass is eviscerated.

"3. In every case where disease is detected by the inspector during the course of his inspection the knife used by him for cutting into any diseased part of the carcass shall forthwith be disinfected before being used on any other carcass.

"4. The manager of an abattoir or the licensee of a meat-export slaughterhouse shall forthwith disinfect, or cause to be disinfected, all instruments which have been used on any diseased carcass or any carcass which the inspector declares to be apparently diseased before such instruments are used on any other carcass. All wiping-cloths used on any such carcass shall be sterilized by boiling.

"5. The manager of an abattoir or the licensee of a meat-export slaughterhouse shall, as and when required by the inspector, cause the head, tongue, and all viscera of stock to be held until post-mortem examination has been completed by the inspector, in such a manner as to preserve their identity with the remainder of the carcass.

"6. Any carcass shall be deemed to be too immature to produce wholesome meat for human consumption and shall be condemned if the meat thereof (*a*) has the appearance of being water-soaked, or is loose and flabby, or tears easily, or can be perforated with the fingers; or (*b*) has a greyish colour; or (*c*) shows that good muscular development as a whole is lacking, which is especially noticeable on the upper shank of the leg, where small amounts of serous infiltrates or small edematous patches are sometimes present between the muscles; or (*d*) shows that the tissue which later develops as the fat capsule of the kidneys is edematous, dirty, yellow, or greyish red, tough, and intermixed with islands of fat.

"7. All unborn and still-born animals shall be condemned.

"8. The carcass of any stock which upon inspection is found to contain any of the conditions or lesions named in the Third Schedule hereto shall be condemned.

"9. The inspector shall cause the carcass of any sheep or lamb which upon inspection is found by him to be affected with the disease known as caseous lymphadenitis to be rejected for export, and such carcass shall thereafter be dealt with as the inspector shall direct.

"10. Where on inspection evidence of tuberculosis is found in a carcass, the carcass shall not be condemned as unfit for human consumption if in the opinion of the inspector: (*a*) the lesions of tuberculosis are localized and not numerous; and (*b*) there is no evidence of distribution of tubercle bacilli through the blood, lymphatics, or by other means to the muscles or to parts that may be eaten with the muscles; and (*c*) the animal is well-nourished and in good condition.

"Provided that in localized infections (i) an organ or part thereof shall be condemned when tuberculosis exists on its capsule or in its substance or in the associated lymphatic glands; and (ii) the head, including the tongue, shall be condemned if any of the lymphatic glands of the head are found to be affected.

"11. The entire carcass and organs shall be condemned when the following conditions are found to be present: (*a*) tuberculosis with emaciation; or (*b*) generalized tuberculosis.

"12. In deciding whether tuberculosus is generalized the judgement of the inspector shall be based on the sum of the evidence of the disease throughout the entire carcass and organs. The following conditions shall be regarded as evidence of generalization: (*a*) miliary tuberculosis of both lungs; (*b*) where the lesions are multiple, acute, and actively progressive; (*c*) where there is multiple and widespread infection of the carcass lymphatic glands; (*d*) where there are diffuse acute lesions of both serous membranes (pleura and peritoneum) and any of the carcass lymphatic glands are enlarged or contain visible tuberculous lesions; (*e*) where, in addition to the presence of tuberculous lesions in the respiratory or digestive tracts, there are also lesions present in the substance of any one of the following parts of the carcass—namely, spleen, kidney, udder (or uterus or ovary), testicle, brain, and spinal cord, and their membranes; (*f*) congenital tuberculosis in calves."

THE DAIRY INDUSTRY

DAIRYING is second only to sheep-farming in economic importance. The value of exports of dairy-produce is generally less than the combined value of wool, lamb, and mutton. During the depression of the 1930's, however, butter and cheese prices proved more stable than those of wool and meat, and many sheep-farmers and graziers temporarily established dairy herds to supplement their incomes. This was one of the main reasons for the high level of production during some of those years.

Again, dairying constitutes by far the most economic utilization of that 6½ million acres of sown and cultivated pasture described earlier as constituting the source of the bulk of New Zealand's wealth from primary produce. The net returns from dairying are higher than would be obtained from any other type of live-stock farming. A further important point is that dairying gives employment to considerably more people than sheep-farming or grazing.

During the Second World War dairying was of considerable importance, as the Dominion provided the bulk of Britain's supplies of butter after the invasion of Denmark, and later supplied considerable quantities of butter, cheese, and processed milk to the American Forces in the Pacific.

The greater part of dairying is carried on for the production of butter and cheese. Increasing quantities of processed milk are being manufactured and the production of casein is higher than before the war.

The quantity of milk absorbed for human consumption is relatively small, because while consumption per capita is high (377 pints per annum) the population of 1,900,000 is small in relation to total production of dairy-produce.

The bulk of dairying is carried out in the North Island, particularly in the Waikato, Northland, Taranaki, and Bay of Plenty districts, where the rainfall is fairly high and well distributed over the year and the land reasonably level and of average to good quality, though possibly requiring the application of artificial fertilizers in the form of phosphates.

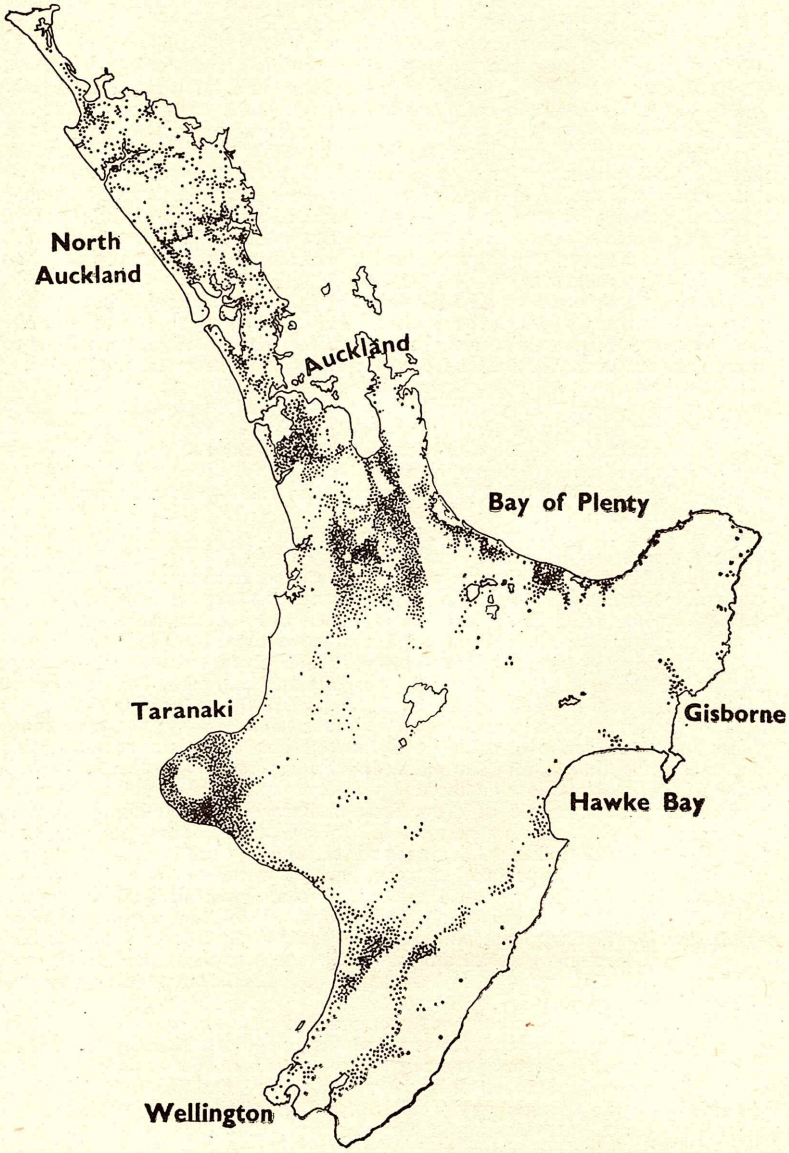
There are several outstanding features connected with New Zealand dairying which to some extent single it out from systems of farming elsewhere. The first of these is the almost complete dependence on pastures for cattle fodder; next is the fact that the climate is sufficiently mild to make the housing of cattle in winter unnecessary, although many dairy herds are equipped with closely woven jute or canvas covers during the winter months, and in the older districts, at least, the typical barbed-wire fence is becoming replaced by hedges and shelter-belts. A final noteworthy characteristic of New Zealand dairying is the high extent to which it is mechanized not only on the farms, but in dairy factories too.

The specialization of the grassland farming technique has been made possible by two important factors, one natural—a climate without extremes of cold and heat and a 40in. or more rainfall well distributed over the year—and the other the development of the use of artificial fertilizers, particularly phosphates. The equable climate and the absence of prolonged drought give an almost continuous growth of pasture through the year, although growth is, of course, at a minimum in winter and during dry summers.

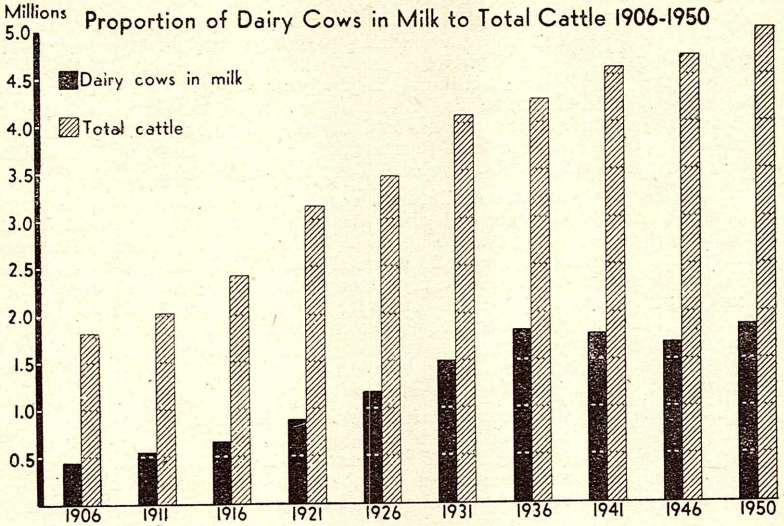
Pastures are principally of perennial rye-grass and white clover, although other grasses and clovers such as cocksfoot, timothy, paspalum, and subterranean clover generally form a substantial portion of the sward. Once a pasture of this nature is firmly established it is seldom disturbed by the plough, any "cultivation" consisting only of harrowing and, of course, top-dressing. The harrows used are of a specially-constructed design to serve the dual purpose of spreading evenly the droppings of the stock and breaking up any grasses which may tend to become matted on the surface of the ground.

DISTRIBUTION OF DAIRY COWS IN NORTH ISLAND

EACH DOT REPRESENTS 500 COWS



Map prepared by Dr. W. M. Hamilton, Department of Scientific and Industrial Research.



An essential feature of the grassland farming technique is the subdivision of the farm into as many fields as is convenient (the size of each, of course, varying with the size of the farm and the number of stock carried). These are grazed in rotation, the herd spending one or two days in each paddock. In practice this system is not always rigidly adhered to. In the spring farmers shut up as much of their farms as possible to conserve the surplus growth for hay and silage. Hay is used to supplement pasture growth in winter and silage principally in the late summer, when absence of rain causes pastures to lose their milk-producing properties.

By far the most important characteristic of grassland farming is the use as an annual top-dressing of artificial fertilizers. Chief of these is superphosphate, all of which is manufactured in New Zealand from imported materials. A fuller account of this is given in the section "The Fertilizer and Lime Industries" (page 105). Agricultural lime is also used in considerable quantities. Much of the dairying is to-day carried on on land which before the days of phosphate top-dressing was considered useless for any farming purposes beyond, perhaps, very limited grazing by sheep. As a result of the use of phosphatic top-dressing, this land is to-day producing 150lb. of butterfat per acre and more. A point too frequently forgotten in regard to New Zealand farming is that most farming is conducted on land which is not naturally fertile or at the best is only potentially so. The land is lacking in an essential element—phosphorus. When this is provided in the form of superphosphate, ground rock phosphate, basic slag, guano, or bone-dust, other plant foods are released and the consequent rich growth of grasses and clovers allows more and more stock to be carried. The natural manure from this stock provides a supply of readily available plant food, which improves the quality of both soil and pasture.

Top-dressing is carried out either annually or twice a year, autumn being the most popular season. Some farmers use quantities of 4cwt. per acre and more each year. It is found desirable, where possible, to apply the fertilizer in two dressings rather than all in one, the former method giving very much superior results. The method of distribution is by specially designed top-dressers. On most level areas top-dressers are often fitted to the rear of lorries, which enables top-dressing to be completed much more quickly.

About 90 per cent of the cows in New Zealand are machine milked. During recent years, as a result of the acute labour shortage, the practice of "stripping"—that is, hand milking to remove the small quantity of milk which the machine leaves in the cow's udder—has mainly ceased. This applies particularly to large herds, and although there is some difference of opinion as to the merits or otherwise of non-stripping, it has speeded up the milking and enabled farmers to carry on under difficult conditions. It can also be said that a fairly large percentage of the milk and cream processed in New Zealand is untouched by hand.

Farmers supplying butter-factories supply cream direct to the factory, in contrast to those concerned with cheese, casein, and processed milk manufacture, who supply the whole milk. In either case when the cream or milk arrives at the factory it is weighed and graded and a sample taken to be tested for butterfat content. All payments connected with the dairy industry are made and worked on a basis of so much per pound of butterfat. Almost all the dairy-produce manufactured is handled by co-operative dairy companies, which have grown rapidly in the past half century and are now developing co-operative trading services for their shareholders, which enable substantial savings to be made.

The Dominion's population of dairy cows in milk of 1,845,510 (on holdings of 1 acre and over outside borough boundaries) is unique, in that Jerseys constitute not less than 85 per cent of the total. These are mostly "high-grade" animals resulting from three to five generations of top-crossing of pure-bred Jersey sires with Shorthorn, Friesian, and Ayrshire cows. Improvement of dairy stock has proceeded in four main stages:—

(1) Before 1920, when concentration on the use of pedigree sires was the main method.

(2) From 1920 to 1940, when selection on both the male and female side was aided by records of production of butterfat of both pedigree and grade cows obtained from a nation-wide, co-operatively organized, herd-recording system (the Group Herd Test) and a State-aided system for pedigree cows only (the Certificate-of-Record and Official Herd Test). Both these are described in some detail later in this chapter.

(3) Since 1940, when recording was extended to the male side with the organization of a Sire Survey Service aimed at locating bulls that have proven their capacity to sire high-producing daughters. This Sire Survey Service is organized by the Herd Improvement Department of the New Zealand Dairy Board, which controls Group Herd Recording under licence and subsidy from the State, and which is collaborating with the Department of Agriculture Animal Research Station, Ruakura, in experiments in artificial insemination.

(4) The investigational stage in the development of artificial insemination techniques capable of application to the specialized conditions of New Zealand dairying has now passed and a start made in providing a national artificial breeding service to New Zealand dairymen. Some commercial development has occurred over the past three years. The Ruakura Animal Research Station and the Herd Improvement Department of the New Zealand Dairy Board organized the first semi-commercial groups in 1949 in Taranaki and Waikato. In 1950 four groups were serviced in these areas, two of which consisted entirely of pedigree cows. In 1951 a total of nine commercial groups was covered in the Northland, Waikato, Taranaki, and Manawatu areas. In this year approximately 5,600 cows, including 1,600 pedigrees, were artificially bred. During the coming season it is intended to extend the number of groups to approximately sixteen, involving 9,000 cows. Up to this time Ruakura has been responsible for all the collecting and processing work and the Herd Improvement Department has handled the field organization. From the 1952 season onward, however, the Herd Improvement Department has assumed complete responsibility for further development. An area adjacent to Ruakura has been acquired by the New Zealand Dairy Board to provide the first completely commercial centre in New

Zealand, though it will be another twelve months before buildings and equipment can be provided which will make it unnecessary to depend upon Ruakura facilities to some extent. The site for the new centre was chosen to permit continued interest of Ruakura research workers in the problem of increasing the efficiency of artificial breeding.

The shortage of Merit or "proven" bulls of adequate standard continues as the main limitation to large-scale expansion. To meet this situation, and the increasing demand for artificial breeding services, highly selected sons of Merit sires from Lifetime Merit Register cows will be employed, mainly with grade or commercial herds. Ten such yearling sons were used in the 1951 breeding season, and a further twelve will be added each year. Such bulls will continue to be used on grade herds until officially surveyed, when those reaching the highest standard will be transferred to the proven bull team for use primarily with pedigree herds. Services from Merit sires to pedigree cows are charged for at the rate of £3 per cow in calf. Surplus material from these and the material from the unproven sons used with grade cows are charged for at the rate of £1 10s. per cow in calf. A seven weeks' service is being provided, since it has been found that more than sufficient cows can be mated successfully in this time to provide the replacements necessary for the herds concerned.

Production results from artificial breeding so far carried out have been encouraging. With the four Merit sires used most extensively the improvement of production in pedigree herds amounted to 29 lb. of butterfat for dams averaging 334 lb. In grade herds the improvement was 32 lb. of butterfat for dams averaging 312 lb.

TESTING OF DAIRY COWS FOR YIELD

As from 31 July 1951 all herd recording has been under the administration of the New Zealand Dairy Board. Two systems of testing are to be operated, the Group Herd Test and the Official Pedigree Test, which is an improved group test, certain safeguards having been added to meet the requirements of breeders of pedigree dairy cattle and to serve as a substitute for the Government Official Herd Test as operated previously by the Dairy Division of the Department of Agriculture.

Though the Government has relinquished its herd-recording work, it was the Government that established cow testing in New Zealand and sponsored its development. As far back as the mid-1890's, after the introduction of the Babcock test, Government dairy experts were endeavouring to devise a system which would be practicable and simple enough to be operated by the farmer. By 1900 a number of dairy-farmers, under the guidance of officers of the Dairy Division of the Department of Agriculture, were testing their herds for butterfat production. In 1909 the Dairy Division established the first cow-testing association. This was the forerunner of similar associations, conducted free of cost for a minimum of two years, in all the principal dairying districts.

To meet the requirements of breeders of pedigree dairy cattle the Department of Agriculture introduced in 1912 the Certificate-of-Record Test. Only cows registered in the New Zealand herd books of the various breeds were eligible. Certificate-of-Record Test was therefore an individual cow test for registered purebreds.

To provide at reasonable cost a service which would enable breeders with cows on Certificate-of-Record Test to obtain production records of their other pedigree cows, the Division introduced in 1927 the Government Official Herd Test. This test also was primarily intended for pedigrees, but later, because of the increasing number of mixed herds, the rules were amended to permit the inclusion of non-pedigrees in certain circumstances.

In 1950–51, the last season during which the Government herd-recording systems were operated, approximately 20,000 cows were tested, these being in the herds of 790 breeders.

THE GROUP HERD TEST

The Group Herd Test was introduced in 1922, and expansion of this test was due considerably to wide use of milking-machines, as they complicated the taking of milk weights and samples, and it became apparent that, if herd testing was to progress, dairy-farmers would have to be relieved of the work of milk sampling and weighing. Under group system testing, officers are equipped with appliances which during machine milking intercept milk between the cow and the milk vat and enable a sample to be taken and the milk to be weighed. Fees for Group Herd Test are on a herd basis and vary considerably, but average about 11s. a cow.

The system takes its name from the fact that the herds are organized in groups of a number which can be sampled once a month by a testing officer. The Group Test is now administered by the Herd Recording Department of the New Zealand Dairy Board.

During the 1950–51 season Group testing was carried out for 7,000 dairy-farmers, the number of cows tested being 435,000, of which approximately 35,000 were pedigrees.

OFFICIAL PEDIGREE TEST

One of the fundamental principles of the Group Test—that the whole of the herd must be submitted for test—applies to the Official Pedigree Test. Any breeder wishing to make entries for Official Pedigree Test must submit for this test all registered pedigree cows in the herd which are in milk. At the same time all grade cows in milk in any such herd must be tested, but under the rules governing Group Herd Test. At least two check tests must be carried out during the season for each herd under Official Pedigree Test. A check test consists of tests of the two milkings immediately after the ordinary monthly testing visit. The months in which the check tests are carried out are decided by the controlling officers of herd improvement associations, and one of the two check tests is carried out when practicable by an officer of an association. Herd improvement associations have the right to make additional checks or can make them at the request of a breed society. Such additional checks are at the expense of the organization concerned. The fees for Official Pedigree Test necessarily are higher than those for Group Herd Test.

ORGANIZATION

Over-all administration of herd recording and improvement by the Herd Recording Department of the Dairy Board is guided by the Director of Herd Improvement. A Herd Recording Council, on which all testing and breeding interests are represented, functions in liaison with the Dairy Board. A sub-committee, the Technical Advisory Committee, advises the Council on technical and scientific matters such as artificial insemination, the utilization of technical and scientific data, and the conduct of experiments and investigations. Another sub-committee deals with the drafting and application of rules relating to Official Pedigree Test.

Recording work on farms and allied services is controlled by six district herd improvement associations, who conform to set standards. Dairy cattle breeders' associations, who are represented on the Herd Recording Council and its sub-committees, protect and advance the interests of their members and of pedigree dairy cattle. All dairy cattle breeders' associations are combined in the New Zealand Dairy Breeds' Federation, whose principal function is to consider broad matters of mutual interest to all breeds.

FARM DAIRY INSTRUCTION

Control by the Dairy Division begins on farms through officers whose designation is farm dairy instructor. Applicants for appointment to these positions are required to have experience of the manufacture of dairy-produce and to be competent to give advice on the erection of milking-sheds, the installation and operation of milking plants and cream-

separators, the correct procedure to be followed to ensure thorough cleanliness in the premises and plant used in the production of milk, and the care of the product until it leaves the farm.

They are responsible for the administration of those portions of the Dairy Industry Act 1908, its amendments, and the regulations under the Act which deal with the points enumerated above, and, where it is considered necessary, have authority to forbid the removal of any dairy-produce from the farm until any defect which will have a contaminating influence and has on a previous occasion been drawn to the notice of the occupant, has been remedied to their satisfaction.

From 21 January 1952 the registration and supervision of town milk supply dairies has been the responsibility of the Dairy Division and the work is done by farm dairy instructors. Previously it was carried out by officers of the Animal Industry Division. The charge for registration is 10s. a year.

Farm dairy instructors are required to work in close collaboration with managers of manufacturing dairies or milk-treatment stations, and on receipt of advice indicating any defect in milk or cream must visit the farm and endeavour to locate the cause and instruct or assist the occupant to remove it.

The farm dairy instructor has no responsibility for the health of the cows, as this work is under the control of the Animal Industry Division of the Department.

The following figures for the year ended 31 January 1950 (the latest published) give an indication of the amount of work involved:—

Cows in milk (excluding boroughs)	1,845,510
Cows milked by machine (number)	1,714,414
Cows milked by machine (percentage)	92·90
Number of milking plants	36,316
Number of dairies (approximately)	60,000
Number of farm dairy instructors	85

Approximately half the dairies are equipped with milking plants of an average size of 3·4 units per plant. The dairies so equipped call for the services of the farm dairy instructor probably in a ratio of two-thirds of his time compared with one-third for hand-milking dairies.

The cost of providing the farm dairy instruction service is on the basis of the industry meeting three-fifths of the amount involved. New rates were fixed in July 1951; they are a levy of 0·018d. per pound on all butterfat credited to suppliers of dairy companies plus a charge of 6s. per supplier.

SPECIAL INSPECTORS

The work of the farm dairy instructors is carried out under the control of the butter and cheese instructors, and general supervision is exercised by special inspectors, of whom there are five. Their "special" work covers the checking of milk and cream testing and grading at manufacturing dairies, the crediting of the fat which it contains, and the payment of the differentials for quality as laid down in the Dairy-produce Regulations 1938.

All milk and cream delivered to manufacturing dairies in the Dominion is paid for (*a*) on the butterfat content and (*b*) on the quality. The testing is carried out by the dairy companies, which, with the exception of less than a dozen, are co-operative. The Dairy Regulations require that the composite samples of milk or cream shall be kept for four clear days following the testing, which, during the summer, must be carried out at least three times monthly. In addition, the methods to be followed in carrying out the sampling, holding, testing, reading, recording, and crediting the weight of fat received are covered by regulation.

Milk for cheesemaking is graded by the New Zealand test, which is a combination of the reductase and curd tests. It is carried out daily.

Cream grading is done by the senses and is carried out at every delivery. Differential payments based on the grade must be made in all cases, and this differential must be shown in the advance payment made

monthly. Thus, any deferred payment made to the suppliers at the end of the year is the same per pound of fat whether the milk or cream has been graded finest, first, or second grade when received.

In addition to the injustice to the supplier, errors in testing have the following effects:—

(*a*) Short crediting reduces the amount of butterfat paid for, and consequently causes an apparently higher rate per pound, which results in unfair comparisons and competition between dairy companies and consequent dissatisfaction amongst suppliers.

(*b*) An over-credit reduces the apparent payout, and, under the New Zealand system of guaranteed prices for butter and cheese, could give cause for a demand for an increase.

Periodical visits are paid to the dairy factories by the special inspectors for the purpose of checking the accuracy of the testing methods to see whether the standard of grading is being maintained, and to inspect the records and ensure that the differential payments are being made as required by the regulations.

The examination of applicants for registration as milk and cream graders is carried out by the special inspectors when necessary.

The grading of milk and cream is directly linked up with the work of the farm dairy instructors. Lists of suppliers from whom faulty produce is being received are supplied to them by dairy company managers, and are an indication of the farms where their services are required in order to locate the cause of the defect. In cases where the farm dairy instructors find difficulty in locating the cause of the defect, in having it remedied when found, or have any problem of construction or administration, the special inspector comes to their assistance and periodically checks up on the efficiency of work being done by the farm dairy instructors.

The special inspector is, in short, the link between the farm dairy instructor, the officers engaged on work at the production end of the industry, which is by far the largest section of the Dairy Division, and the butter and cheese instructors, who are intimately associated with manufacturing.

BUTTER AND CHEESE INSTRUCTION WORK

Butter and cheese instruction work covers many phases and it necessarily follows that instructors must be thoroughly practical. The practice of recruitment for this work from the ranks of successful creamery and cheese factory managers has been justified. In all cases they have had long experience of dairy factory work and management, as indicated by the results obtained before receiving an appointment, and are competent to advise managers and directors of dairy companies on practical and policy matters covering all phases of the work of the organization.

Included in the instructor's duties is giving advice on the erection or re-erection of and alterations to existing dairy factory buildings. Generally the plan submitted with the application is drawn by an architect in collaboration with the instructor, who advises regarding the general design, but takes no responsibility for the workmanship in carrying it out.

In addition, approval of the plant must be obtained from the Director of the Dairy Division, and, in practice, the instructor is generally consulted before it is purchased, and advises on the selection and installation, though no recommendation of any particular make is given.

Although the instructor is responsible for the administration of the regulations, which cover all phases of the manufacturing process, this feature is not brought into prominence in his association with the manager of a dairy factory, although it is clearly understood that he has such matters under close observation. His attitude generally is that of an adviser, and when any difficulty arises, whether in the quality of the supply, the functioning of the plant, or the quality of the finished product, his assistance is available at call, and without payment, to advise and assist the manager to locate the cause and, if possible, suggest a remedy. His duty in such cases is to give "coat off" instruction and help, and in the smaller factories full charge of the whole of the operation is

frequently taken. Where, due to the size of the output, this is not possible without unduly interfering with the mass production methods which must be employed, he will endeavour to locate the cause, and the stage of the processing at which the defect is developing, and suggest the steps which should be followed to remedy it.

Should the fault be due to defects in the milk or cream, the farm dairy instructor is advised and will visit the farm and endeavour to locate the cause. Should it be one of manufacture, and modifications in processing are suggested, the grader-in-charge will be asked for a telegraphed report on the quality of the butter or cheese when received at the port of shipment. Or he may think it necessary to visit the port and see the grading carried out. On the other hand, should the grader find a marked drop from the usual standard in any factory he immediately advises the instructor.

In addition to carrying out instruction work, butter or cheese instructors also act as supervisors over the work of the special inspectors and the farm dairy instructors.

There are at present seven officers engaged in butter instruction work and ten in cheese instruction work, either full or part time. To ensure uniform methods in the manufacture of dairy products, two superintendents, with Dominion coverage, supervise the work of each group of instructors.

TREATMENT OF MARKET MILK

The Dairy Division assumed responsibility for the administration of market milk treatment on 1 January 1947, when appropriate regulations came into force. There are at present some forty milk-treating houses in the Dominion, these being defined as premises where milk is pasteurized for sale for human consumption.

To be in a position to give an adequate and up-to-date service to this section of the dairy industry an officer with a thorough training and wide experience in market milk treatment in England was appointed to the staff of the Dairy Division as Superintendent of Market Milk. He is assisted by a market milk instructor, and it has arranged that butter and cheese instructors in the various districts should render some assistance in the general supervision of the operation of these plants.

MANUFACTURING METHODS IN THE DOMINION

BUTTER MANUFACTURE

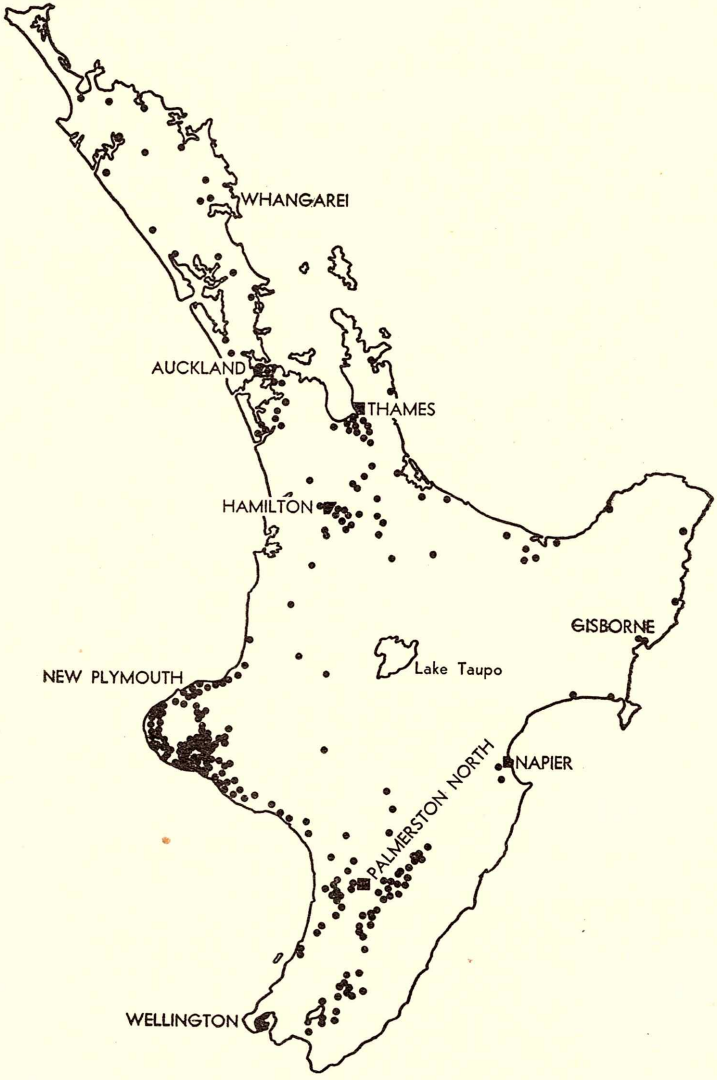
With the exception of the cream separated in milk powder, casein, and condensing factories and a very small quantity separated in cheese-factories during winter, all cream received at New Zealand creameries is separated on the farm. The general set-up on the farm is, except in small herds, a milking plant and separator driven by electric motor either direct coupled or from a shaft; the size of the separator is such that the separation of the milk finishes within a few minutes of the completion of milking.

Cream collection is by motor-lorry from the farm gate by the dairy company lorry or by a contractor employed by the dairy company, delivery being to the creamery or to the railway. The cost of collection is paid by the dairy company. Collection of the great bulk of the cream produced is made daily in the dairying season, with less frequent intervals during the winter and in those districts where mixed farming is carried on (chiefly in the South Island).

At the creamery the cream is weighed, sampled and graded daily, testing being carried out thrice monthly by the use of a composite sample. Acidity of the cream on arrival ranges from 0·12 per cent to 0·16 per cent, which is reduced to 0·07 per cent to 0·1 per cent, bicarbonate of soda being the usual neutralizer. No starter is used and the acidity at churning is consequently about 0·1 per cent.

Approximately 80 per cent of the butter produced in 1950 was made by the vacreation pasteurizing process, the balance being treated by flash pasteurization.

DISTRIBUTION OF DAIRY FACTORIES
NORTH ISLAND



Cooling by direct-ammonia-expansion coolers of various types to a temperature of 45 degrees F. or less and churning at that figure or lower are general, with higher temperatures in the South Island.

Cream is held overnight in circular jacketed vats lined with stainless steel and fitted with ammonia expansion coils and agitators, the cream being transferred to the churns next day through pipe-lines connected to a high-speed rotary pump.

Churns are of the internal-worker end-delivery type made in the Dominion and vary in capacity from fifty to one hundred boxes of butter each weighing 56 lb.

Churning usually requires thirty to forty-five minutes. Working time is dependent on the time required to give as near as possible the 16 per cent maximum moisture content allowed by regulation. Salt content is limited by regulation to from 1 to 2 per cent except under special permit.

The general practice is to have cream of low acidity with no starter added, high pasteurizing temperatures, quick cooling to low churning temperatures, and thorough working to the stage where no free moisture is visible when a plug of butter is drawn from the box. Uniformity in practice from creamery to creamery, with due allowance for climatic and district variations, results from the supervision exercised by the seven butter instructors engaged in this work, and well-made butter will vary little in appearance or flavour from district to district.

Moulding machines of the extrusion type are in general use and give a block of butter free from cavities, over which the box is placed after the block has been wrapped in parchment. After filling, each box, which is already branded, is stamped with the churning number and the date of manufacture. If desired, the machine employed for 56 lb. boxes can be used to manufacture pound pats by fitting a suitable extrusion opening.

After storage in the creamery cool room for at least twenty-four hours butter is despatched to the grading stores at the port of shipment, where it is stored at a temperature of 15 degrees F. or less until shipped overseas.

Figures for the manufacturing season 1949–50 are as follows:—

	Tons.
The largest creamery produced	6,668
The average output per unit was approximately	1,370

Cost of manufacture—	Pence Per Pound Fat.
Lowest	2·122
Highest	5·903
Average	2·960

Paid to suppliers—	
Highest	29·512
Lowest	24·300
Average	28·720

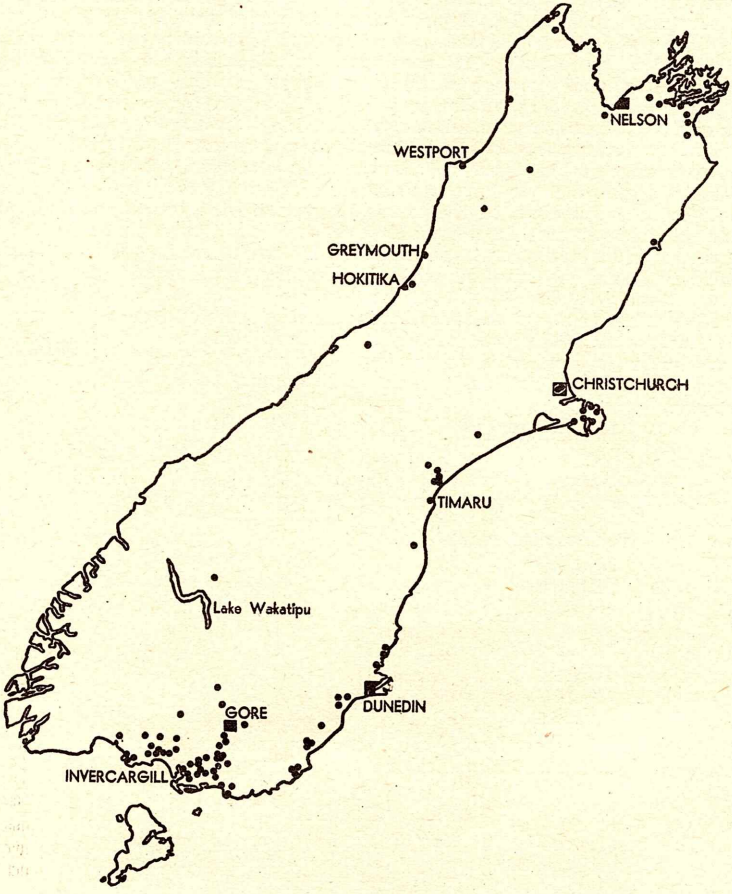
(Payments are actually made and expenses are calculated on the pound of butterfat in New Zealand.)

CHEESE MANUFACTURE

The usual practice in New Zealand is for the farmer to deliver his own milk to the cheese-factory, though contract collection on the lines followed for cream is used in some districts. A recent development in milk delivery is the use of bulk tanks by individual farmers. The tanks are made of stainless steel and carry up to 400 gallons in two compartments, so that night and morning milk may be kept separate. These tanks are mounted on a motor-truck, from which they are easily removed when the truck is required for other farm-work.

Whey is, in some instances, fed to pigs at the dairy companies' piggeries, but is usually taken back to the farm by the supplier the day after the milk is delivered. This presents a difficulty when contract collection is used.

DISTRIBUTION OF DAIRY FACTORIES
SOUTH ISLAND



Sampling and testing are dealt with by the methods previously described, but the weighing is done on a scale fitted with a weigh can.

Only full cream cheese may be made in the Dominion (except in a few factories where experiments are being conducted), and milk separation is not permitted in a cheese-factory while cheese is being made. The average test of the milk exceeds 4·4 per cent of butterfat.

Over 90 per cent of the cheese is made from milk pasteurized at a temperature of about 150 degrees F. by passing it through heat-exchanging machines, chiefly of the plate type. These have a capacity of up to 6,000 gallons per hour, and deliver the milk into the cheese-vat at a temperature of 86–90 degrees F., with or without the use of the water section of the heat exchanger, according to the time of year.

Cheese-vats of up to 2,500 gallons capacity are in use and the cheddar process is used exclusively. Starters made either from pure cultures supplied by the Dairy Research Institute at Palmerston North or from commercial cultures at present being imported are used for ripening the milk, and the many problems associated with cheesemaking by this process the world over are experienced.

Difficulties in maintaining active starters have been the greatest drawback to the maintenance of cheese quality, and the lack of vitality has been proved to be caused by air-borne bacteriophage. The rotational use of various strains of starter cultures, the sterilization (by filtration and heating) of air admitted to the starter during cooling, and the complete isolation of starter-making rooms offer the most promising solution to this problem.

Certain small variations from general practice in the process of manufacture are followed in some factories, but the aim in New Zealand must always be the manufacture of a firm-bodied cheese which will stand up to the treatment involved in shipment to a distant market.

Milling of the curd is done by a mill of New Zealand design, and presses are of the horizontal type holding fifteen cheeses each of 80–82 lb. Automatic devices for maintaining continuous pressure are now standard equipment in many cheese-factories.

Pressing is continued for eighteen hours, after which cheeses are removed to the curing-room and the cheese-hoops are prepared for further use. The finished cheese is held on shelves in the curing-room for three weeks in spring and two weeks in summer before being packed in twelve-sided crates for shipment to the grading-stores. The number of the vat and the day of manufacture are stamped on both ends of each crate.

During recent years very great improvements have been made in curing-room construction. Most modern rooms are provided with cork insulation, and an increasing number are equipped with automatic temperature and humidity controls.

Before the outbreak of war about one-third of the cheese manufactured was coloured and 60 per cent waxed. At the request of the British Government both practices were dropped. The reason for this request was to facilitate sorting ex ship and distribution.

The twelve-sided crate, bound with one wire at each end and at the centre board, the wires being stapled between each of the twelve battens, has been found to stand up to the handling involved in rail or coastal shipment to the cool stores and subsequent shipment overseas. Scale boards of peeled wood are placed at each end of the packed cheese to prevent sticking while crates are stacked on their ends in the cool stores in the Dominion and Great Britain. Cheese crates are always stowed on their sides on board ship.

Storage temperatures for cheese while in store or on board overseas ships vary from 42 degrees F. in summer to 49 degrees F. in spring.

Figures relating to cheese manufacture for the 1949–50 season are as follows:—

	Tons.
The largest factory produced	1,640
The average output per unit was approximately	440

REGISTRATIONS AS AT 31 MARCH 1950 OF DAIRY-PRODUCE CREAMERIES AND FACTORIES

Province.	Creameries.	Factories.	Dual (Butter and Cheese).		Forwarded for Export, 1 April 1949 to 31 March 1950.			Number of Suppliers.		
	Butter.	Cheese.		Total.	Butter.	Whey Butter.	Cheese.	Butter.	Cheese.	Dual.
					Tons.	Tons.	Tons.			
Auckland	50	25	1	76	118,416	527	17,675	20,576	1,416	351
Taranaki	16	74	20	110	11,804	1,587	52,901	2,479	1,849	1,459
Wellington	15	37	3	55	11,250	391	12,166	4,208	1,113	459
Hawke's Bay	8	11	1	20	3,824	42	3,604	2,809	314	188
Nelson	6	—	—	6	2,102	—	—	1,392	—	—
Marlborough	2	4	—	6	334	24	1,129	580	126	—
Westland	4	—	—	4	473	—	—	466	—	—
Canterbury	5	11	—	16	659	13	1,710	5,086	258	—
Otago	2	12	—	14	44	118	1,647	2,854	285	—
Southland	1	40	—	41	—	196	9,457	2,053	1,376	—
Totals	109	214	25	348	148,906	2,898	100,289	43,503	6,737	2,457
COMPARATIVE SUMMARY										
1949	109	208	39	356	137,774	2,527	90,160	41,968	6,325	3,180
1948	113	210	40	363	132,191	2,409	85,767	42,890	6,216	3,446

* Where dual suppliers are shown, the break-up between butter, cheese, and dual is estimated.

	Pence Per Pound Fat.
Cost of manufacture—	
Lowest	4·761
Highest	10·234
Average	5·764
Paid to suppliers—	
Highest	33·055
Lowest	26·801
Average	30·785

(Payments are actually made and expenses calculated on the pound of butterfat in New Zealand.)

Most of the whey produced in cheesemaking is separated and the cream is made into whey butter and sold as such. Boxes containing whey butter must carry a red brand, and the standard of grading is that first grade whey butter equals second grade creamery.

Approximately one box of whey butter is obtained to each ton of cheese manufactured.

PROCESSED MILK PRODUCTS

Formerly considered of relatively minor importance, the manufacture of dried and condensed milk in various forms, particularly milk powders, has developed to industry proportions. For the 1950–51 season thirty-three factories produced milk powder in one form or more, twenty-eight were engaged in roller drying of buttermilk, eleven in roller skimmed milk powder manufacture, five in producing spray skimmed milk powder, and five in making both roller and spray whole milk and blended powder.

Casein has also been produced in fairly considerable quantities, production increasing from 2,400 tons in 1938–39 to about 5,000 tons in 1950–51.

DAIRY-PRODUCE GRADING

The grading of dairy-produce for export began in the Dominion in 1894. Authority was contained in the Dairy Industry Act of that year and is at present covered by the Dairy Industry Act 1908, its amendments, and the Dairy-produce Regulations 1938, Serial Number 1938/91. It is carried out at ten main ports in the Dominion. The charge for the service is 0·291d. per pound of butter and 0·0137d. per pound of cheese manufactured, payable on total manufacture as disclosed in the annual accounts and balance-sheets of dairy companies.

Storage charges are based on schedules arranged between the owners of the stores and the industry, and vary from port to port and according to the length of time the produce is in store. They cover receiving into store and delivery to ship's side, and include all work of opening and re-closing packages required for grading and check weighing and stamping of packages with grading marks.

They also include provision of accommodation for the grading staff, covering office and laboratory requirements and space required for handling packages for grading and weighing.

Equipment for carrying out the work is provided by the Department of Agriculture.

The grader in charge exercises supervision over the whole of the work (for which the owners of the stores undertake responsibility at the time when the building is gazetted as a grading-store), including temperature and humidity records both during holding and at time of shipment, records of incoming and outgoing produce, stocks in store, and all matters covered by the Dairy-produce Regulations 1938. He also takes note of the condition of the produce on arrival at the stores and advises the owners of any defect which indicates neglect at any point during transit.

Shipment overseas is controlled by the Dairy Products Marketing Commission, which receives copies of the advice notes sent by consignors to graders of all consignments forwarded for grading. Normally the owners of the cool stores are responsible for stacking in such a way that all produce in store is readily available for despatch by any vessel nominated by the Dairy Products Marketing Commission to the port which is indicated on the advice note. Grading is compulsory for butter, cheese (including processed cheese), and whole-milk, skimmed milk, or buttermilk powder manufactured by the roller method of drying which are to be exported. The purpose of grading when first started was to indicate to the maker of the produce the points which were considered by an independent judge to be defective when compared with other lines of the same product. As time went on the grade notes, copies of which were supplied to the buyers of the product or the consignment house to which it was shipped, became commercial documents on which the payments authorized by these firms were made by the banks.

Under the present system of purchase by the Dairy Products Marketing Commission at a differential price depending on the points awarded by the grader, an even greater responsibility rests on the grader as an individual and on the Dairy Division of the Department of Agriculture to maintain a uniform standard in grading at the various ports. For this purpose an officer, the Superintendent of Grading, visits all grading-stores throughout the Dominion regularly during the export season.

For grading, one box of each churning of butter or one crate of cheese from each vat is examined and graded finest, first, or second grade, and the consignment stamped accordingly. The system inaugurated for the grading of roller-process milk powder products for export includes analysis for moisture and fat, sediment test, and grading by the senses. The powder is classified Grade 1 or Grade 2.

Grading, using the word as a general term, covers the following procedure, the results of which are sent to the dairy company:—

(1) Points indicating quality based on an examination of one plug of butter from each churning and one plug of cheese from each vat. Payment for the produce is based on the grade notes issued by the grader.

(2) Check weighing of approximately 4 per cent of each consignment of butter and cheese. These weights are accepted as final for the purpose of payment.

(3) Butter. Examination of every churning for water and salt, particulars of which are issued with each grade note.

Examination three times monthly of a composite sample of one day's make of butter of each brand for curd content.

Fat content is calculated by difference.

(4) Cheese. Examination of a composite sample consisting of a portion of a plug from each vat in every consignment for fat.

Examination of composite samples monthly for water.

Considerable work has been done on the testing of dairy-produce, particularly cheese, for sediment, with a view to such a test being included in the scheme of grading and payment for quality.

In addition to the ordinary grade note, special reports are furnished on request on any line or part of a line of produce received at the grading-stores, and in any case where there is a serious drop in quality from the usual quality the instructor for the district is notified.

ANALYTICAL AND LABORATORY EXAMINATIONS

Analytical and laboratory work is divided into two sections:—

(1) Routine examinations of all produce coming forward for grading.

(2) Examinations by qualified officers for bacteriological and metallic contamination of produce, and general assistance to instructors and graders.

The purpose of the first, which is carried out at every grading-store, is to check composition of the produce graded. The work covers tests for water and salt (each churning), fat and curd (three times monthly), fat (each consignment of cheese), and moisture (at least one consignment of cheese monthly). Since the fat, water, and salt contents for butter are limited by regulation, the primary object of this work is for administration purposes. The fat content of New Zealand cheese is so high that the 50 per cent minimum of fat in the water-free substance is seldom approached. In the case of both butter and cheese the fat content is used as a basis for calculating the amount of fat which has been recovered in the manufactured article, and from it and the yield, which must be furnished to the grader by the dairy company, is calculated the percentage of the fat received which has been credited.

Butter which does not comply with the regulations in respect of either water or salt content is returned to the maker and must be reworked.

Examinations under (2) are carried out at the Dairy Division Laboratory at Wallaceville and at the grading-stores at Auckland. They cover bacteriological examinations of butter, the results of which are sent to the instructor concerned and have proved useful for locating unclean conditions in certain parts of the manufacturing equipment; also chemical examinations for copper and iron, which indicate defects in the tinning of the plant, and pH determinations, which show faulty neutralizing methods.

The scope of the work has been extended recently to include the anlaysis of milk powder products, microscopic examinations for classification purposes, and sediment tests of dairy-produce.

LONDON STAFF

It is the practice to maintain two officers of the Dairy Division in London for periods of five years or more, and on occasions another officer spends a year there. The officers' duties include regular inspections of all types of dairy-produce exported to Great Britain from the Dominion and investigation of complaints about quality and out-turn.

The grade stamp placed on the containers in the Dominion embodies a cipher which indicates the month and day of grading and the grade of the contents. From this it is possible to note whether the produce has retained its original quality, and detailed reports are forwarded to the dairy company, the instructor, and the grader concerned, while one copy is retained in head office.

In addition, these officers keep in touch with those engaged in the wholesale and retail trade and with developments in the dairy industry, and render a service the value of which cannot be assessed, forming, as they do, a link between the producers in the Dominion and the retailers in Great Britain.

As already stated, the principal function of the Dairy Division is the improvement of the quality of the dairy-produce manufactured within the Dominion. In its efforts to do this it has been necessary for officers to give a lead and assist in the introduction of any process which promised to result in improvements in quality, a reduction in cost of manufacture, better management, and a higher return to the dairy-farmer for his butterfat.

Instances are: The introduction of pasteurization of milk for cheese-making and cream for buttermaking, both of them essential from the point of view of keeping quality in view of the distance from the market. Moisture control in buttermaking, which has added many thousands of pounds to the return to suppliers of cream. Reduction of fat losses in manufacture and uniformity of make and quality of butter through temperature control. Manufacture of whey butter. Improvements in the design of dairy buildings in supplying and manufacturing dairies, leading to a reduction in production costs, and general organization of the industry from the farm to ship's side.

BY-PRODUCTS OF LIVE-STOCK INDUSTRY

Hides, Skins, and Pelts: In the large meat-export works use is made of every particle of the animal. Probably the most important by-product is still wool—*i.e.*, wool removed from the skins of slaughtered sheep. This is dealt with in the section on wool and is not really a "by-product" in the true sense of the word. Other by-products are hides, skins, pelts, tallow and lard, sausage casings, canned meats, meat meal, and blood and bone fertilizers. The greatest monetary return is obtained from hides, skins, and pelts, exports alone totalling £9,375,318 for the calendar year 1950, a figure which excludes £420,863 worth of deer, rabbit, and opossum skins. In addition to exports 860,377 sheep-skins and pelts and 679,243 cattle hides were used by local tanners during 1949–50 for the manufacture of leather.

Total production, which is, of course, largely dependent on total slaughterings and hence does not alter substantially from year to year, is as follows:—

TABLE 19—PRODUCTION OF PICKLED PELTS AND HIDES

Pickled Pelts—			
Sheep	5,200,000*	Lamb	14,200,000*
Hides—			
Ox	221,878	Yearling	50,799
Cow	488,452	Calf (vealer)	47,725
Bull	27,625	Calf (bobby)	1,127,449

* Estimate

Most of the cattle hides are used locally, but nearly all the sheep-skins, pickled pelts, and bobby-calf hides are exported.

Preserved Meats: Preserved meats, which are mostly canned, make use of considerable quantities of meat which, though perfectly free from disease, is not suitable for direct human consumption. In the season 1949–50, 270,800 cwt. of meat and edible offal were canned and 188,220 cwt. of preserved meats and other canned products were produced.

Tallow: Tallow and lard are obtained principally from the meat-export works, the boiling-down works, and the ham- and bacon-curing establishments, although certain quantities are also supplied direct by farmers and from country butchers. Total production is not accurately known and statistics are arrived at by multiplying total slaughterings of each class of stock by what is considered to be a reasonable estimate of tallow per head likely (on the average) to be obtained. This figure is, of course, subject to a certain seasonal variation because of animals (particularly culled cattle) arriving at the works in varying degrees of condition resulting from the prevailing feed situation. In an average year total production from the respective sources would probably be as follows:—

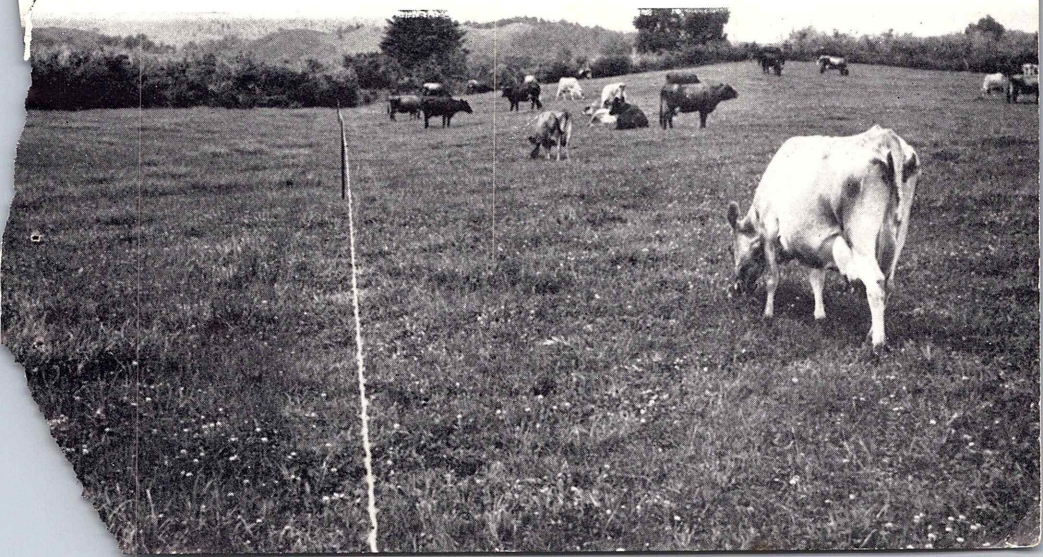
TABLE 20—ESTIMATED PRODUCTION OF TALLOW AND LARD

	Long Tons.
Cattle	17,500
Sheep and lambs	21,300
Boiling down and manure works	8,900
Ham- and bacon-curing establishments	1,000
Other (say)	1,000
	49,700

There are many different types and grades of tallow, ranging from first-class edible beef tallow to material suitable only for certain industrial purposes. During the year ended 31 December 1950, 31,264 tons of refined animal fats and tallow were exported, realizing £3,416,759.

[*National Publicity Studios photo.*

Grass is the main food of New Zealand stock. Hay and silage made from surplus pasture growth are the main supplementary fodders, though in addition stock often have grazing from pasture growth saved in autumn. Above—Making hay on a Waikato farm. Below—Break feeding of pasture by use of an electric fence.

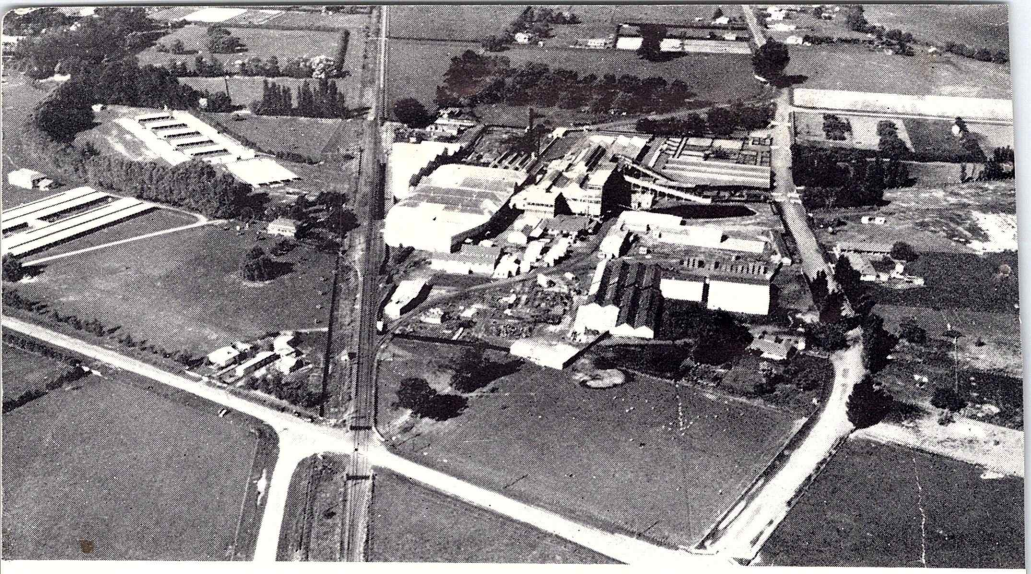


[*National Publicity Studios photo.*

Beef cattle on their way to the rail head in Westland. In New Zealand beef cattle are used mainly as "implements" to control pastures and secondary growth. Beef cattle are bred principally on hill country and fattened on the better-class lowlands.

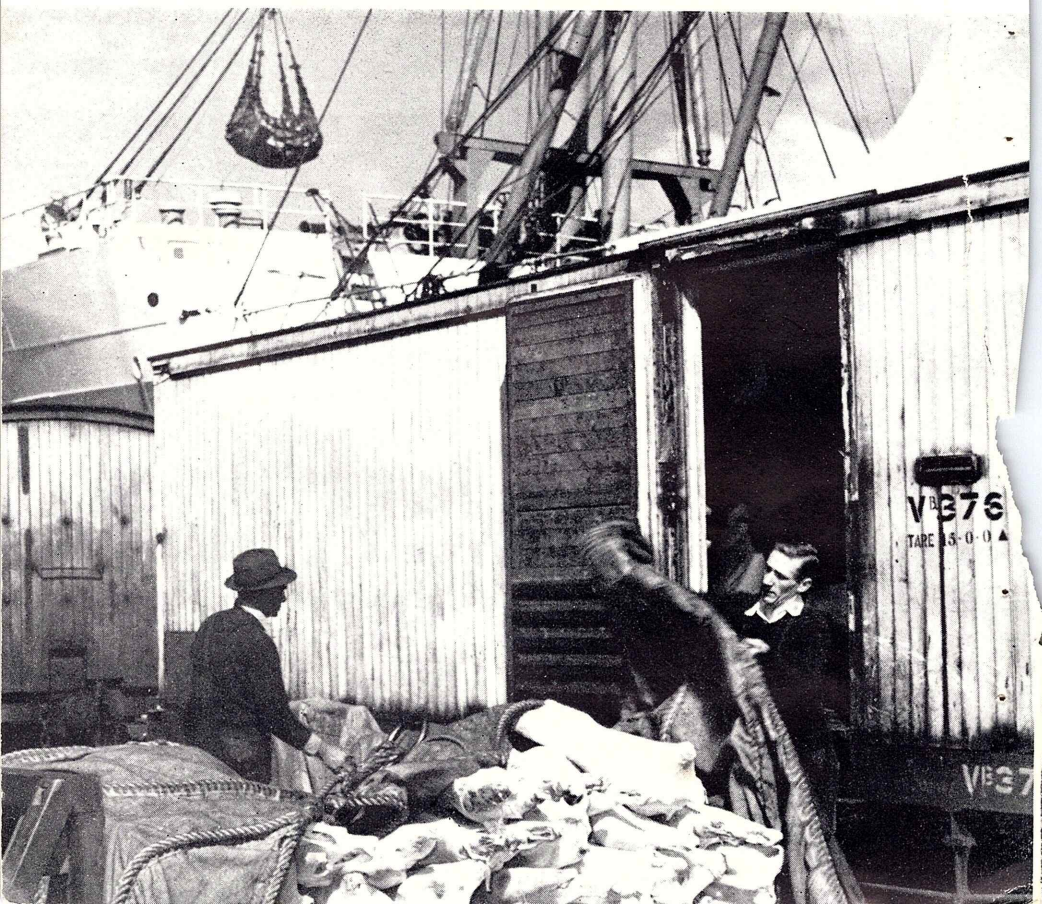
The Canterbury Plains between Sheffield and Oxford, showing the Gorge Bridge over the Waimakariri River. Most of New Zealand's cereals are produced in Canterbury.

[*V. C. Browne photo.*



[*N.Z. Aerial Mapping photo.*

Above—Tomoana Freezing-works, Hawke's Bay. Below—Loading carcasses of frozen lamb into a ship at Wellington.



CONTROL OF LIVE-STOCK DISEASES

THE control of infectious diseases of animals is embodied in the Stock Act 1908, the administration of which is one the functions of the Animal Industry Division of the Department of Agriculture.

Fortunately, the Dominion is remarkably free from serious diseases of stock. The insular nature of the territory has lent itself admirably to the control of the importation of all animals under verterinary certification from recognized disease-free countries, and with a strict application of any quarantine measures considered necessary from time to time it is expected that the Dominion will retain its good record in regard to serious diseases of live-stock.

Such diseases as foot-and-mouth disease, swine fever, pleuro-pneumonia, rinderpest, and glanders do not exist in the Dominion. Again, in a country with such a large sheep population, the fact that sheep scab was so thoroughly eradicated in the earlier years of settlement has been of inestimable value in the production of lamb, mutton, and wool.

The Director of the Animal Industry Division fulfils the function of the chief veterinary officer for the Dominion. For administrative purposes there are four districts, Auckland, Palmerston North, Christchurch, and Dunedin. The live-stock superintendent in each district controls a staff of Government verterinarians and lay inspectors of stock, who operate from suitable stock centres. There are also two quarantine stations, on islands in Wellington and Auckland harbours, where stock imported from overseas are segregated for a suitable period as a precaution against the entry of disease.

Certain dangerous infectious diseases of stock are scheduled under the Stock Act, and the control of the diseases is carried out by the field officers of the Animal Industry Division. These officers also investigate mortalities and disease outbreaks in farm stock, and one of their most important functions is the carrying-out of extension work in animal husbandry, with a view to increasing production and reducing losses.

All stock passing through saleyards are inspected for notifiable diseases by the inspectors of stock, and action taken when necessary. The combination of officers in the field, who also have access to the returns at the meatworks and abattoirs, gives valuable information in estimating the incidence of stock-disease in the different parts of the country.

A scheme to eradicate tuberculosis from the dairy herds supplying milk for local consumption is now being carried out. All dairy herds registered for the supply of milk for sale for human consumption in New Zealand must by law be submitted to the tuberculin test at suitable intervals. Reactors to the test are condemned and compensation is granted to owners. The testing is carried out by the field veterinarians of the Animal Industry Division. Much work in the vaccination of heifer calves against contagious abortion disease is also carried out by these officers.

Other measures of disease control include the compulsory annual dipping of sheep.

These examples illustrate the measures taken in the control of some of the more prominent diseases which are recognized as being established in the Dominion. Although a comparatively small number of diseases is scheduled under the Stock Act, field veterinarians and livestock instructors in their daily contact with farmers do a considerable amount of animal advisory work in relation to many other diseases, particularly in regard to general feeding, management, and all aspects of animal husbandry affecting all classes of farm animals.

Manures and Meat Meal: These are dealt with together, because both are manufactured from offal, unwanted meats, and a certain amount of bone. There is therefore no clear distinction between meat, liver, and bone meals intended solely as stock-feeds and organic manures such as dried blood, and blood and bone. Because this is so, it was found necessary in 1943, when there was an acute shortage of fertilizers, to prohibit the use of meat meal as a fertilizer.

Total production of all organic fertilizers (in terms of blood and bone) is now approximately 29,000 long tons annually, all of which is used locally. In fact, the present demand greatly exceeds the supply.

Over the past few years production of meat meal has been 15,000 to 17,000 tons annually. Meat meal is a meal of high protein content (up to 65 per cent) and is principally used as a fattening feed for pigs. Small amounts, mixed with other ingredients in the form of a mash, are used by poultrykeepers.

Other By-products: There are a number of other items, individual statistics of which are not available, but which cumulatively are of worth-while value. For example, some 2,000 tons of sausage casings are exported annually. During the year ended 30 June 1950, 2,315 tons of casings were exported. Other by-products include neat's-foot oil and gelatine, manufactured from animals' hooves. Ductless glands for the preparation of various types of hormones for medicinal purposes are also recovered on a large scale, including substantial amounts of pancreatic glands for the production of insulin, which are forwarded to the Commonwealth Serum Laboratories, Melbourne, Australia.

ANNUAL CROPS

OVERSEAS visitors often find it difficult to appreciate the relative unimportance of arable farming in this essentially farming country. There are a number of reasons for the limited area sown in grain crops, chief of which is the ability of the farmer to produce pasture and so concentrate more on animal husbandry, which under present conditions is very profitable and requires the minimum of labour additional to that normally employed.

Wheat: There was a time when New Zealand produced much greater quantities of wheat than are grown to-day. In the early 1880's, for instance, about 400,000 acres were sown and the yield was 8 to 10 million bushels, of which 3 to 5 million were exported.

With the development of wheat-growing in Canada, Australia, and elsewhere, however, world wheat prices gradually fell and at the same time the development of refrigerated export enabled New Zealand to specialize in those fields of primary industry to which the climate and topography are best suited. With the fall in overseas prices, wheat-growing was no longer economic. Although yields were more than twice as heavy as those obtained in the big wheat-growing countries, land values and other costs were so much higher in New Zealand that to maintain wheat production at all it became necessary to assist the industry by a sliding scale of prices.

The best district for wheat-growing is Canterbury, especially the Canterbury Plains, an area of rich land with low to moderate rainfall, a cold winter, and ample summer sunshine. To-day about 70 per cent of wheat for threshing is grown in Canterbury and most of the remainder in Otago. Wheat-growing is almost always associated with other cropping (oats, barley, or potatoes) or with fat-lamb raising. Rotation of crops is practised, green fodder crops such as kale, rape, and oats, and roots (turnips, for example), because generally these are fed *in situ*, serving to spell and enrich the ground after a period of the heavy demands of wheat. Certain portions of the farms are put into temporary pasture which is allowed to remain from four to six years.

The average area threshed from 1946 to 1950 was 139,608 acres, and, in addition, small areas were utilized as chaff, hay, and silage and fed off and cut for green fodder.

Oats: With the decline of horse transport the area sown in oats also has decreased. From 1946 to 1950 the average area sown was 179,482 acres, of which 61,336 acres were threshed, 70,725 acres were chaffed or made into hay and silage, and 47,421 acres were fed off or cut for fodder. The average yield of the threshed area was 48 bushels per acre. About 30 per cent of the threshed oats is milled, 20 per cent used as seed, and the balance (of which a certain proportion is wastage) is used as stock-food. As with wheat, the bulk of the oats for threshing is grown in Canterbury, but Otago and Southland together grow nearly as much.

Barley: The production of barley has increased steadily. For the period 1946 to 1950 the average area sown was 66,431 acres, of which 56,142 acres were threshed, 628 acres cut for chaff, hay, and silage, and 9,661 acres were fed off or cut for green fodder. The average yield of the threshed barley is about 38 bushels per acre. The grain, apart from that required for seed, is used mainly for malting and stock-feed, particularly in the preparation of poultry mash and stock-foods. The Canterbury Land District supplies 80 per cent of the barley grown.

Maize: Unlike other cereals, maize is not grown to any extent in the South Island. The warm climate together with the fertile land required for successful maize-growing is to be found in parts of the North Island, especially the east coast districts. Average sowings from 1946 to 1950

In the dairying districts, for instance, advice is given on the problems of abortion, sterility, mastitis, calf rearing, calf losses, parasitic disease in calves, spring calving troubles, bloat, and all husbandry problems dealing with feeding and management of dairy calves and stock. Similarly, in sheep areas field officers assist in the control of enterotoxæmia disease in lambs, outbreaks of pregnancy toxæmia disease in ewes, bearing trouble in ewe flocks, foot-rot in sheep, internal parasites in lambs and hoggets, and all aspects of sheep husbandry, including advice in the areas where deficiency diseases are known to exist. As pig production is carried out in association with dairying, pig husbandry and pig diseases are dealt with and investigated from time to time.

CONTROL OF RABBITS AND NOXIOUS WEEDS

The administration of the Rabbit Nuisance Act and assistance to county and town Councils and Boards of Management in the administration of the Noxious Weeds Act are functions of the Animal Industry Division. Livestock instructors of the Division act as local Government representatives on the various Rabbit Boards and also supervise the expenditure of public moneys by local bodies and by other Government Departments on the control of noxious weeds.

There is very close co-operation with the Rabbit Destruction Council, the national body which co-ordinates the activities of all Rabbit Boards and which makes recommendations to the Minister of Agriculture for subsidies to the Boards from funds voted by Parliament for rabbit destruction. Such subsidies are supplementary to the rabbit rates raised by the Boards in their respective areas, on which a pound-for-pound subsidy from Government funds is also paid.

were 13,513 acres, of which 7,212 acres were threshed, 107 acres ensiled, and 6,194 acres fed off or cut for green fodder. Maize for green fodder is very popular with owners of pedigree dairy herds to maintain dry-weather production. Very little maize is used for human consumption. A small amount of maize starch is made, but all but a very small proportion of New Zealand's maize crop is used as stock-feed. Average production of grain from 1946 to 1950 was 389,032 bushels.

Onions: As with potatoes, onions are grown only to supply the local market. The main cropping areas are in the North Auckland (principally Franklin County), Wellington, and Canterbury Land Districts. The average area sown during the period 1946 to 1950 was 1,245 acres, yielding 11,132 tons.

Tobacco: Tobacco growing and curing have been carried on in New Zealand for a number of years, mostly in the Nelson district, to which tobacco-growing is now confined. Production has increased considerably in recent years, partly because of the difficulty of obtaining supplies from overseas and partly because of an increase in the amount of tobacco consumed. The average area planted from 1946 to 1950 was 3,965 acres, yielding 4,653,954 lb. of tobacco. This represented a substantial increase on pre-war planting and since even 1945. Considerable quantities of tobacco and cigarettes are still imported.

Peas: Peas are the only pulse grown in New Zealand in quantity. About half the total area sown consists of garden varieties and half of food varieties. During the war the acreage in peas (as will be seen from Table 59) increased considerably to meet United Kingdom contracts and the requirements of the United States Joint Purchasing Board, but acreages have since declined appreciably. Apart from seed requirements, most of the crop, both of garden and field peas, is exported. About 2,000 tons of field peas are used locally—the blue type as whole dried peas and the maple type as split peas, soup powder, pea meal, &c. Garden peas are used locally to sow areas to produce green peas for immediate consumption and for canning and quick-freeze purposes. Peas of low quality are generally used in stock meals.

Linseed: Linseed has been grown spasmodically for many years, the areas sown ranging from about 300 to over 18,000 acres between 1940 and 1950. Before 1940 the seed obtained was sent to Australia (except small quantities sold for human consumption and animal feed) and the oil extracted there. In 1940 the linen flax industry was established in New Zealand, and this greatly increased the amount of seed available for processing, even though linen flax does not yield as much oil as linseed. A factory was established to process the seed, and in view of the world shortage of supplies of linseed oil endeavours have been made to get farmers to grow more linseed.

The record crop, 18,728 acres, was grown in 1947–48. The acreage then dropped again to 7,535 in 1949–50, but an incentive price recently announced should encourage farmers to increase the acreage. Supplies of linseed meal (oil cake), a by-product from the extraction of oil, amount to about 3,000 tons annually.

Potatoes: Potatoes are grown now for local consumption only. Statistics are, of course, available only of commercial production. In addition, considerable quantities are grown by home gardeners and by farmers in lots too small to include in the official statistics.

More than 50 per cent of the potato crop is grown in Canterbury; early or "new" potatoes are grown in a few frost-free areas, particularly Pukekohe Hill, in Franklin County. The average annual potato acreage from 1946 to 1950 was just over 20,000 acres, about 1,000 acres below the pre-war average. Production is influenced greatly by the yield per acre; for example, in 1949 it was necessary to import 3,000 tons to supplement local production, but in 1950, though the acreage was lower than in 1949, 7,000 tons were exported.

(For statistics of production of annual crops, see Table 59, p. 156).

SEED PRODUCTION

GRASS AND CLOVER SEEDS

THE importance of grass in New Zealand farming has been constantly emphasized. It is natural, then, that considerable importance should be attached to the production of high-quality grass and clover seeds. Though the local market is of prime importance in the disposal of the seeds produced, considerable quantities surplus to local requirements are exported. The quantities exported during and immediately following the war increased considerably compared with those of pre-war years, but there are indications that the overseas demand for New Zealand seeds is now weakening.

The following table indicates the average production in long tons immediately before, during, and since the war, as well as the estimated proportions used locally during these periods.

TABLE 21—PRODUCTION OF GRASS AND CLOVER SEEDS AND PERCENTAGE USED LOCALLY

	1934–39.		1940–45.		1946–50.	
	Average Production.	Average Per Cent. Used Locally.	Average Production.	Average Per Cent. Used Locally.	Average Production.	Average Per Cent. Used Locally.
	Tons.		Tons.		Tons.	
Perennial rye-grass	5,762	80	6,911	79	9,179	73
Italian rye-grass	1,471	73	2,186	53	2,287	71
Short-rotation rye-grass*					1,054	83
Cocksfoot	876	88	659	66	701	88
Crested dogstail	376	64	330	39	763	25
White clover	415	73	947	28	2,015	32
Red clover	763	74	1,107	54	1,616	43

* Production began in 1944–45.

This table records the main varieties of grass and clover seeds harvested in New Zealand, which are also the most widely used in New Zealand pasture-seed mixtures. Three others, paspalum, subterranean clover, and timothy, are also used under specific soil and climatic conditions, but seed of these is not produced locally in sufficient quantity to meet requirements.

Despite the importance of grass and clover seed as an item of revenue on many farms, the saving of pasture seed is always regarded as secondary in importance to the proper feeding of farm live-stock. An occasional farmer may aim to make seed production the most important part of his farming activities, but frequently even such farmers will sacrifice a seed crop to provide adequate feed for live-stock. Seed production is considered by most farmers as a means of converting surplus pasture growth into cash rather than as a major method of utilizing the productive capacity of the land. Despite the major importance of the local market as an outlet for the seeds produced, it is the overseas market which determines all seed prices, almost to the exclusion of all other factors.

Under present conditions no great expansion in production can be envisaged, but a lowering of prices would quickly bring about a reduction in the quantities of seed saved.

Thus the factors governing the volume of seed production are the necessity for utilizing grass growth primarily for feeding stock, the effect of seasonal conditions on the availability of surplus growth and on unit seed yields, and the incentive of overseas prices for surplus seeds.

IMPROVED STRAINS OF PASTURE PLANTS

Although barely a century has passed since most of New Zealand's pasture plants were introduced, there have developed, under the varying conditions of soil, climate, and pasture management, several regional strains of herbage plants, some of which are not only outstanding under New Zealand farming conditions, but are showing promise of economic importance overseas.

Scientific workers, making use of the natural material available, have raised by a process of breeding and selection strains even superior to the best occurring naturally, and these "pedigree" strains have now become the basis of grassland establishment. Grassland farmers are realizing more and more the importance of strain in relation to production and are demanding seed of the more persistent, leafy, and high-producing strains for sowing down pastures. The seed of such strains is indistinguishable from that of strains of inferior quality, and but for the system of seed certification in New Zealand a good strain of seed would quickly lose its identity in commerce. The certification scheme controlled by the Department of Agriculture provides a means of identifying seed of superior strain and enables expansion of production to take place with a degree of facility and reliability so important to the producer and the user of the seed.

CROP SEEDS

Crop production in New Zealand does not provide a large direct contribution to the country's exports; its importance lies in its provision of human foodstuffs and of fodder for live-stock to augment supplies during the lean periods of pasture growth.

Many of the varieties grown are not in commercial production elsewhere, because, though they are particularly suitable to local conditions, they have been replaced overseas or because they have been bred or selected in New Zealand to meet specific requirements. Only in peas has there developed a regular export trade. Apart from this item there is little trade, either export or import, in crop seeds.

Before the outbreak of war most supplies of brassica seeds were imported from Great Britain, but since then the production of rape, turnip, swede, chou moellier, and kale seeds has been developed to meet local requirements.

Scientific workers are making use of the most promising crops available, in the same manner as with pasture species, to develop varieties which have higher yielding ability, better disease resistance or improved quality, or which are more suited to local conditions. The quality of the crop seeds available in commerce is maintained under the certification scheme of the Department of Agriculture.

SEED CERTIFICATION

The seed certification scheme has been developed to cover most of the farm seeds produced in New Zealand. The procedure of certification, though differing in detail for individual seeds, conforms to a general pattern for all seeds. The basic features include identification of the origin of the seed sown, inspection of the producing area at an appropriate stage of growth, and identification of the produce from harvest through the dressing procedure and until it reaches the consumer.

In most species there are three classes of seed (as described below) in commerce. These may be regarded as steps in multiplication, to provide sufficient seed to meet requirements, but where for any particular seed this aim can be reached in fewer than three steps the earlier steps are eliminated.

(1) Nucleus lots of seed are produced as a result of intensive breeding and selection programmes to develop superior or pedigree strains. This nucleus seed is multiplied by the Department of Agriculture and distributed to selected farmers. These farmers in turn harvest seed which qualifies as "Certified Pedigree Seed."

(2) Certified Pedigree Seed is marketed through commercial channels and the produce of areas sown with this seed is recognized as "Certified Mother Seed." In a few species Certified Mother Seed may also be produced from areas established in the best natural strains, but the proportion of seed of natural strain certified in this class becomes less as the distribution of seed of pedigree strain extends.

(3) The final certification class is called "Permanent Pasture" or "Standard," depending on whether or not the species has claims to permanence. Seed certified in this class is usually the produce of areas sown with Certified Mother Seed, though in some species seed of naturally occurring high-quality strains may also gain recognition. As with such seed certified in the Mother class, however, the quantity of seed of natural strain to gain recognition is progressively becoming less.

THE WOOL INDUSTRY

WHEN dealing with international statistics for sheep and wool it is not possible to get them all up to date at any given time. This is due to a variety of reasons, such as lack of regular collection and time lag in publication. Some of the figures which follow, therefore, are pre-war, but they serve for general illustrative purposes. It was estimated that in 1947–48 there was 684,600,000 sheep in the world. Of these, almost half were non-woolled or bore very light fleeces, so that the total of world wool production was 3,720,000,000lb. The average fleece weight was only 5·4lb. a head. It was estimated that of the total world wool production in 1947–48 approximately 33 per cent was of Merino type, 46 per cent of crossbred type, and the remaining 21 per cent carpet wool. Preliminary figures for 1951 give world sheep numbers as 762,000,000. Tables 22 and 23 show that New Zealand ranks fifth in the list for number of sheep and third as a wool producer. New Zealand is also second as an exporter of wool.

TABLE 22—WORLD SHEEP NUMBERS*

Country.	Number (Millions).	Country.	Number (Millions).
Australia	118	South Africa	31·9
Russia	86	U.S.A.	31·5
Argentine	50	Uruguay	26
India	†	Spain	26
New Zealand	33·8	United Kingdom	20·4

* U.S. Department of Agriculture data. † Not available; estimated at 40,000,000 for Indian subcontinent.

TABLE 23—WOOL PRODUCTION 1951*

Country.	Weight (Million lb.).	Country.	Weight (Million lb.).
Australia	1,200	South Africa	240
Argentine	440	Uruguay	190
New Zealand†	390	Spain	100
Russia	335	United Kingdom	85
U.S.A.	260		

* U.S. Department of Agriculture data. † *Monthly Abstract of Statistics.*

New Zealand's specialty is the production and export of crossbred wool, and in this field her only serious competitors are the Argentine and Uruguay. During the war this type of wool was in great demand for uniforms, because of its strength and durability.

In the five-year period 1934–39 an average of 53·8 per cent of New Zealand's exports of greasy wool went to the United Kingdom. Of this, an unspecified amount was subsequently re-exported, but Britain has always been New Zealand's best market. France, Japan, the United States, and Germany were the Dominion's other main customers, but the relative importance of their buying fluctuated a great deal from year to year. From the outbreak of war Britain bought the whole wool clip each year; this arrangement continued for the duration and did not conclude until early in 1946. During the five-year period 1946–50 44·3 per cent of New Zealand's exports of greasy wool were to the United Kingdom.

DEVELOPMENT OF THE INDUSTRY

The wool industry has steadily evolved and expanded from the earliest days of settlement and to-day wool is one of New Zealand's major items of export. Since first settlement wool has contributed more to her revenue

than any other single product. Although development has been more or less steady and progressive, it is convenient to observe it as several periods, and those which best lend themselves for the purpose are:—

From first settlement until 1916.
From 1916 to 1920—generally referred to as the "commandeer" period.
From 1920 to 1939—the post First World War period.
From 1939 to 1946—which can be called the "appraisement" period.
From 1946 to 1951—the Joint Organization period.
From 1951 onward—Wool Commission minimum floor-price period.

1835 to 1916

The first record of wool being exported from New Zealand is of a few bags of Merino wool sent from Mana Island in 1835 to Sydney for sale. As the sheep population expanded, the custom was to send wool and tallow direct to Britain for sale, and the first local auction sales were not held until about 1866. This practice rapidly expanded, as the farmers felt that they had a better chance of obtaining ruling market values by this method than by private treaty. As the quantity of wool offered and the importance of the local market increased, large overseas manufacturers found it advisable to send buyers to obtain wool at first hand at the New Zealand wool auctions. Many farmers, however, still preferred to ship their wool direct to London and sell it there by auction, claiming that this practice paid them better in the long-run. Some of the larger stations, particularly in the South Island, made a practice of scouring their wool (to save transport costs) before shipping it to London—there was no demand on the local market for the scoured product. It was claimed that the practice gave a better return.

By the season 1914–15, 322,000 bales of wool were sold in New Zealand, of a total value of nearly £5,000,000. By the following year the value for a similar quantity of wool had jumped to nearly £8,000,000, but because of World War I, marketing conditions were rapidly becoming very uncertain and auctions, as they had previously existed, impossible.

1916 to 1920—"The Commandeer"

Under a proclamation of 21 December 1916 the Crown became the sole buyer and seller of wool, and wool brokers were appointed to act as agents of the Government in these transactions. Wool growers had to deliver their wool to the store of a Government broker, where it was examined, classified, and valued by two experts, one of them appointed by the Government and the other by the broker. A detailed price and type schedule for all wools was prepared, and the Imperial Government agreed to pay a price 55 per cent above the ruling average price for the 1913–14 clip. All charges incidental to handling the wool were met by the Imperial Government, so that the purchase price was the actual net cash return to the grower. As the Imperial Government also agreed to return to the grower half the profits on any wool resold, but to bear any losses incurred itself, the scheme was a generous one to the wool grower.

Four clips were requisitioned under the scheme: 1916–17, 1917–18, 1918–19, and 1919–20—a total of 2,350,000 bales of wool to the value of almost £59,000,000.

1920 to 1939—The Post First World War Period

At the close of the commandeer period Britain still held enormous stocks of unsold wool, including almost 800,000 bales from New Zealand. It was in an effort to dispose of this surplus without completely glutting the market that "Bawra" was formed. The name stood for British Australia Wool Realization Association, Ltd., and it was established in January 1921. In addition to the operation of Bawra in disposing of old stocks of wool, regulations were brought in in New Zealand first completely prohibiting any sales of the new clip for two months and later

allowing increasing quantities to be sold, but with the imposition of a minimum price. As market prices were steadily rising, the minimum price clause was revoked in 1922, but a legacy from this period was the control of quantities of wool offered at auction sales by a wool committee. With the disposal of all surplus wool stocks by 1924, Bawra was dissolved after performing in an outstanding manner a necessary and difficult task. However, the wool committee continued its work until 1947, when its functions were assumed by the Wool Disposal Commission, and then in 1952 by the Wool Commission.

1939 to 1946—The Appraisement Scheme

On the outbreak of war in 1939 the appraisement scheme was immediately put into effect. It had many points of similarity with the previous "commandeer," on which it was to a large extent based. Again, all wool had to be sold to the Government, this time the New Zealand Government acting on behalf of the British Government. Britain undertook to buy all New Zealand wool for the duration of the war and for one season thereafter, again with the generous provision of a half share for the grower in any future profits and yet no responsibility for losses. Once more a comprehensive price and type schedule was drawn up covering all grades of New Zealand wool and the scheme was again administered through a team of appraisers appointed by the Government.

In the main, the appraisers were members of the Wool Buyers' Association, the only body available, at such short notice, with the requisite experience for this highly-skilled work. The first step after the outbreak of war was to draw up a "bareme" or schedule of wool types and prices. Some idea of the magnitude of this task can be gauged from the fact that eventually 977 types of greasy wool were established, for each of which a standard clean scoured price had to be fixed, so that the over-all average price to the farmer for the 800,000-odd bales of greasy wool falling into these many different grades would work out at 12·25d. per pound, the figure agreed upon with Britain. At the beginning of the 1942–43 season Britain increased this price by 15 per cent, bringing it into line with the similar increase granted to Australia. Besides the "bareme" for greasy wool there was another for the slipe wool from the freezing-works and the fellmongers, embracing nearly 500 additional types.

On the whole the scheme worked very smoothly considering the very large volume of wool handled, and the experience gained in the six and a half years of appraisement proved the way for the next step in the evolution of wool marketing. For the first time the producer knew in advance what his wool would bring and thus had reasonable stability of income.

1946 to 1951—The "J.O." or Joint Organization Period

A wool conference held in London early in 1945 between representatives of the Governments of the United Kingdom, Australia, New Zealand, and South Africa unanimously recommended that a Joint Organization should be formed by the four Governments to handle the marketing of the surplus wool accumulation and expedite the sales of the new clips. On 30 June 1945 the total stocks of wool of Dominion origin were:—

	Million lb.
Australia (63 per cent)	2,060
South Africa (20 per cent)	645
New Zealand (17 per cent)	540
	3,245

"J.O." was set up as a private registered company with a nominal capital of eight shares held as follows: United Kingdom Government, 4; Australian Government, 2; and New Zealand and South African Governments, 1 each. Early in 1946 the central "J.O." in London adopted the name "United Kingdom-Dominion Wool Disposals, Ltd.", and this body operated a separate wool "pool" with each Dominion on a fifty-fifty

financial basis. The New Zealand branch or subsidiary of the "J.O." was known as the New Zealand Wool Disposal Commission and consisted of representatives from the Government, wool growers, and the New Zealand Wool Brokers' Association.

The United Kingdom–New Zealand pool took over the surplus stocks of New Zealand wool at their original cost (under appraisal), which was estimated at £32,500,000 sterling. The New Zealand Government had to find half this sum, but on the credit side New Zealand was entitled to half of the estimated divisible profit of £7,000,000 sterling from the appraisal system. This left New Zealand a net debit of £12,750,000 sterling, which was met in four annual instalments of £3,200,000 sterling.

The operating expenses of "J.O." were borne equally by the wool-growers and "J.O." itself. The growers paid in the form of a levy on all wool sold and "J.O." by deductions from the proceeds of sales of its wool stocks. The ultimate over-all balance of profit at the termination of the scheme was shared equally between the United Kingdom and New Zealand Governments.

The basic policy of the Joint Organization was that as from 30 June 1946 there would be a return to the auction system of selling wool, but that in future a "floor" would be placed under farmers' returns by establishing minimum reserve prices for each grade or type of wool. The "J.O." would buy in at the reserve price all new wool not auctioned at or above these reserves. The grower could, if he wished, withdraw his wool or ship it on his own account to the London market. It was intended that a proportion of old stocks of wool should be offered concurrently with the new clips each year as the scheme progressed.

In practice it was necessary to offer old stocks mainly at crutching sales and at the beginning and end of the season to avoid congestion in brokers' stores during the busy periods. It was estimated that it would take thirteen years to liquidate the Commonwealth surplus of wool, but this estimate proved wide of the mark, as is indicated by the following table.

TABLE 24—STOCKS OF WOOL HELD BY "J.O."

Stock at	Australia. Bales.	New Zealand. Bales.	South Africa. Bales.	Total. Bales.
31/7/45	6,796,000	1,777,000	1,834,000	10,407,000
30/6/46	3,789,000	1,425,000	572,000	5,786,000
30/6/47	3,076,000	1,092,000	347,000	4,515,000
30/6/48	2,271,000	801,000	146,000	3,218,000
30/6/49	1,254,000	411,000	35,000	1,700,000
30/6/50	379,000	104,000	1,000	484,000
30/6/51*	11,842	5,601	2	17,845

* In July 1951 the bulk of these stocks, except for 4,500 bales held in New Zealand, were sold.

Provision was made in the original plan to review the scheme at the end of five years, and as the tasks for which the Joint Organization was formed had been completed, the organization went into liquidation in 1952.

At the beginning of each wool season the general level of the reserve prices was fixed by the Governments and reserve prices of each type of wool by the central "J.O." in London. These prices were determined on a similar basis for any given type of wool throughout the three dominions. The appraisers in the dominions inspected each lot of wool submitted for sale and announced a reserve price for it, based on the London figures. This did not prevent a grower from putting a higher reserve than the "floor" price on his wool.

Prices must vary in accordance with general world conditions and the need to expand consumption. The activities of "J.O." were designed to act as a stabilizing influence, and it was hoped that wide fluctuations in

prices, both during the season and from one season to another, could be avoided by adequate offerings and reserve prices and that at the same time full scope would be given for selection and enhanced prices for special lines.

"J.O." was never put to a severe test in upholding wool prices. Only in New Zealand did it have to buy in a significant quantity of wool (107,892 bales in 1946–47, which represented 10·3 per cent of that year's clip). It appears that "J.O." was unable to do anything to prevent prices rising to unprecedented heights in 1948–49 and 1949–50. The organization did not have enough of the right kinds of stock wools in the right places to release at the appropriate moment to influence prices.

1951 Onward—Wool Commission Minimum Floor-price Period

On 1 January 1952 the New Zealand Wool Disposal Commission changed its name to that of the New Zealand Wool Commission. It had finished disposing of accumulated stocks of wool, but the members of the same staff were used to administer the new minimum floor-price plan. All wool offered at auction is still valued by the Commission's appraisers on the basis (at present) of an over-all average greasy price for the whole clip of 24d. per pound ex store.

If bidding on an individual line fails to reach the maximum floor price set by the Commission, the Commission may buy in the wool at the floor price or it may subsidise the sale price to bring it up to the floor price without buying in the wool. So far only the first alternative has been adopted—to buy in 1,600 bales during 1952.

The original legislation provided that the powers of the Commission should expire on 30 September 1952, but the Government has now signified its intention to renew the Act for an indefinite period.

FROM SHEEP'S BACK TO MILL

New Zealand's wool normally flows from the farm to the manufacturer as follows: the sheep are mustered by shepherds with dogs and brought to the sheepyards, where they are held and those requiring it are "dagged" (pieces of dung are clipped off the wool round the tail). The sheep are put into the wool-shed, where they are held overnight. This causes them to sweat and makes shearing easier next day. Most properties use shearing-machines, but some of the high-country stations in the South Island still use blade shears to leave more wool on as a protection from the cold. Shorn sheep are wool marked with the owner's brand and returned to their paddocks. The shorn fleece is picked up and thrown on a slatted wool table, where it is skirted, this procedure involving the removal of all the inferior wool from the main portion of the fleece, which is then rolled into a compact bundle. On most of the larger properties it is now usually classed by a specialist woolclasser, who classes fleeces of similar type together into the bins, where they are held until required for pressing into packs by a manually operated press. These bales (averaging about 340lb.) are stencilled with the owner's brand, bale number, and description of wool, and despatched to the wool broker. When wool is received by the broker, description and weights of bales are noted, and the bales piled up in stacks. A proportion of each line of bales is put on the well-lighted top floor of the store, where the ends are cut open to display the wool, which is valued by competing buyers, who subsequently bid for it at auction. The wool which has been pulled out is pushed back into the bales, and these are then check weighed and resewn. Shipping marks are placed on the bales, and then it is usual to "dump" them—that is, force two bales into the volume normally occupied by one—by means of a powerful hydraulic press, and bind them with steel bands or wires. They are then carted or railed to the ship, and exported. This is the usual procedure, but there may be certain deviations.

NORMAL METHODS OF DISPOSAL

At the beginning of the century only a quarter of the wool grown in New Zealand was sold through the auction sales conducted by the wool brokers, the remainder being sold by direct consignment to Britain or by private treaty to country wool buyers. By 1913 approximately half the clip was being sold at auction, and by 1934 the proportion had risen to 81 per cent. Just before the war this figure had risen still further to approximately 85 per cent, so that it would be safe to say that sale at public auction is the normal method of disposal for most of the wool grown in New Zealand. Methods of disposal open to the grower are as follows:—

(1) Sell wool at auction through a broker—
(*a*) The broker both skirting and classing the wool.
(*b*) The farmer doing the skirting, but leaving the classing to the broker.
(*c*) The farmer skirting and classing, the broker merely displaying and selling.
(*d*) Small lots are often skirted and sent to the broker for binning; or
(*e*) Sent to the broker for skirting and binning. (Binning is the process of gathering together large numbers of fleeces of similar type and from various sources to make a large, even, saleable line.)
(*f*) Lines of three bales or less may be "interlotted" by the broker with other small lines of similar type to avoid "star lots". (A "star" is any lot of less than four bales, and is not sold in the main catalogue.) There is a nominal charge for interlotting, while binning is charged for by the pound, but in many cases the latter method still brings the grower the better net return.

(2) Ship direct to England for sale at the London wool auctions.

(3) Scour wool locally and ship to London for sale. There is normally no demand for the scoured product in New Zealand.

(4) Sell by private treaty to an itinerant wool buyer.

GRADING AND INSPECTION

Grading and inspection are not normally Government functions. There is no compulsion on the farmer to carry out any grading of his wool, although it is in his own interests to do so. He may class his wool himself or employ a professional wool classer, or he may leave these functions to his broker.

Inspection of wool offered for sale at auction comes within the province of both the Wool Brokers' and the Wool Buyers' Associations. Both these bodies have books of rules and regulations which cover the manner in which wool is to be handled, displayed, and sold. The buyers' association employs an inspector, who visits the wool stores before sale and sees that the brokers observe the conditions mutually agreed upon between the two associations.

Although the Government enforces no laws covering the grading of wool, the Department of Agriculture advises farmers on the best methods of preparing their wool. There are now nine officers whose work is mainly the giving of advice, lectures, and demonstrations to farmers on wool growing and the proper preparation of their wool for sale. This instructional work covers the whole of New Zealand and is carried out in conjunction with a certain amount of investigational and extension work on related problems, all with the same ultimate objective—namely, to encourage the most efficient methods of wool production combined with the most effective means of marketing.

Another way in which the Department has helped the wool industry is in the testing and approval of wool-marking or branding preparations. Since 1 May 1947 it has been illegal to sell or use anything except the preparations approved by the Department. The samples submitted by manufacturers are applied to sheep and given a season's weathering. Preparations are approved only if they scour out at any period during the twelve months.

TYPES OF WOOL PRODUCED

Table 12 gives a list of the numbers and percentage of the different breeds of sheep in New Zealand, which, after making due allowance for differences in fleece weight between breeds, will give an approximate idea of the amounts and sorts of wool produced. In the wool trade, however, certain characteristics other than breed are of overriding importance, and fineness of fibre diameter is one of the most important. Broadly, New Zealand's wool can be divided into two groups—Merino and crossbred—using the latter term in its widest sense—that is, all wools intermediate between Merino and carpet types. In practice, the crossbred group, which constitutes approximately 98 per cent of the wool, can be subdivided into several other trade categories. It may be said that the "counts" or "quality numbers" really signify average fibre diameter—the higher the count the finer the fibre. The range given below covers all the wool produced in New Zealand.

N.Z. Trade Description of Wool:	Count:
Fine Merino	70's
Medium Merino	64's
Strong Merino	60's
Quarter-bred	58's
Half-bred	56's
Half-bred	54's
Three-quarter-bred or superfine crossbred	50's
Fine crossbred	48's
Medium crossbred	46's
Strong crossbred	44's
Low crossbred	40's
Lincoln	36's

Other countries, of course, produce wool outside this range, such as the superfine Merino wool of Australia or the coarse carpet wool of India; the above figures give merely a broad outline of the usual practice of grading on "quality" (with reference mainly to average fibre diameter), but other factors, such as length, soundness, colour, efficiency of skirting, freedom from vegetable matter, &c., are all taken into account in determining the commercial value of the wool.

New Zealand's wool production (on a greasy basis) for 1949–50 was estimated at 390,000,000 lb. This figure covers all wool produced and includes fleece wool, oddments, crutchings, wool on skins, slipe wool, and scoured wool after necessary adjustments have been made to the two latter classes to convert the weights to a greasy basis.

Precise information regarding the destination and uses of New Zealand wool is lacking, but it is possible to mention in a general way the sort of fabrics usually made from certain kinds of wool.

It takes fine wool to make fine fabrics, and Merino is used for high-quality underclothing, knitting yarns, high-class worsteds, and fine dress materials. The quarter-bred and half-bred types (including Corriedale) are used for a similar range of products to Merino wool, but with less emphasis on softness and more on durability. They are also used for flannels and high-quality travelling rugs and blankets. Three-quarter-breds and fine crossbreds are used for a wide variety of purposes, including army

uniforms, overcoating materials, knitting yarns, sports fabrics, rugs, and blankets. Medium crossbred is used for material where durability is required, such as army battledress and overcoats, blankets, serges, and sports tweeds. The coarser crossbred type is used for upholstery materials, rugs, felts of various kinds, braid, &c. Lincoln wool may go into carpets, furnishing fabrics, roller lappings, bunting, &c. The Down type wools, which include the major portion of the slipe wool (removed from skins at freezing-works) have special properties which make them particularly suitable for such things as high-class hosiery materials and flannels.

During 1949–50 there were twelve pure woollen-mills in New Zealand, five works engaged in other textile industries (carpet, hosiery, knitting), and four small units engaged in weaving only. These firms used 9,639,000 lb. of greasy wool during 1949–50 for the manufacture of a complete range of woollen and worsted products, including made-up garments and knitwear. Some of New Zealand's mills are celebrated for the exceedingly high-quality travelling rugs which they produce.

In addition, there are twenty-four wool-scouring works in the country, from which the output has fluctuated considerably in the past, but which worked to capacity and scoured on an average some 150,000 bales per annum during the war.

TABLE 25—N.Z. WOOL PRODUCTION AND EXPORTS*

Season (Year Ended June).	Estimated Total Wool Production. (000 lb.)	Total Wool Exports. (000 lb.)	Percentage for Export.	Percentage used Locally.	Value of Wool Exports. (£000)	Value of Wool Sold at Auction or Appraised in New Zealand. (£000)	Average Price per Lb. of Wool (Greasy) Sold at Auction.
							d.
1934–35	265,000	200,385	96·7	3·3	6,328	4,486	6·54
1935–36	304,300	317,865	97·5	2·5	12,762	10,083	9·13
1936–37	302,900	286,465	97·5	2·5	18,771	15,344	15·71
1937–38	296,800	258,619	97·6	2·4	12,326	9,028	10·04
1938–39	327,700	305,491	97·8	2·2	12,899	9,386	9·17
1939–40	310,000	272,326	96·2	3·8	14,664	15,828	12·85
1940–41	331,500	197,881	95·7	4·3	11,611	17,273	12·87
1941–42	345,000	238,921	95·3	4·7	14,129	18,173	12·88
1942–43	340,000	248,565	95·1	4·9	15,216	19,917	14·58
1943–44	330,000	245,784	94·8	5·2	16,307	19,424	14·60
1944–45	372,000	123,180	95·8	4·2	9,124	22,013	14·61
1945–46	365,000	282,919	96·6	3·4	20,642	21,552	14·51
1946–47	367,000	413,111	97·1	2·9	32,879	23,136	17·83
1947–48	362,000	422,581	96·0	4·0	42,849	29,868	25·11
1948–49	367,000	437,419	96·3	3·7	47,249	31,326	25·80
1949–50	390,000	405,846	96·5	3·5	60,066	48,163	37·98

* From official statistics and Dalgety's *Annual Wool Review*.

[The apparent discrepancies between the second, third, and fourth columns are due to a varying carry-over caused by shipping difficulties.]

WOOL RESEARCH AND EDUCATION

There is a levy on every bale of wool exported, most of the income from which goes to provide New Zealand's contribution to the work of the International Wool Secretariat in London, represented in the Dominion by the New Zealand Wool Board. Wool research is carried out by Massey Agricultural College, the Wool Manufacturers' Research Association, the Department of Agriculture, and the Department of Scientific and Industrial Research. Specialized courses in sheep-farming are available at a number of agricultural high schools and at the two agricultural colleges, while instruction in wool classing is given at several technical colleges, by Massey College, by the Department of Agriculture, and by Canterbury Agricultural College.

PHORMIUM TENAX

PHORMIUM TENAX, commonly but erroneously referred to as New Zealand flax, is a plant peculiar to New Zealand. It grows in clumps of sword-like leaves of from 5ft. to 8ft. long and 5in. to 6in. wide, strong fibres being distributed throughout the leaf as a support. It is these fibres which constitute the commercial value of the plant. *Phormium tenax* was used by the Maoris for many purposes and was one of New Zealand's earliest exports.

With the increasing competition from Manila hemp and Mexican sisal, the export trade diminshed considerably and at the outbreak of the Second World War the industry was languishing and receiving Government subsidies. The outbreak of war greatly increased the demand for cordage, and after the spread of hostilities to the Pacific a large contract was made to supply the United States Navy with rope. When this contract expired production continued to fall because of the cutting out of areas previously subsidized and the closing of three mills due to labour difficulties. The total area in phormium in 1945–50 was 46,413 acres, only a small proportion being millable. The area planted is only about 3,000 acres, the remainder being natural stands. Any given area can be cut only once every four years. For the five years before the Second World War annual production averaged 6,000 tons of fibre and 1,000 tons of tow, but during the war these figures fell to 4,000 and 600 respectively, and production is now about 5,000 tons of fibre and tow combined. The industry supplies at least a third of New Zealand's requirements of woolpacks.

HORTICULTURE

COMMERCIAL horticulture in New Zealand, which covers fruit, vegetable, flower, and plant-nursery production, caters primarily for the domestic market, and apart from apples, of which fairly considerable quantities have been exported, little horticultural produce is exported.

FRUIT-GROWING

Because of New Zealand's geographic position, the climate is varied and favours the production of a wide variety of fruits. The climate in most parts of Northland, Auckland, Bay of Plenty, and Gisborne is sufficiently mild for the production of citrus and other sub-tropical fruit such as passion fruit, tree tomatoes, and Chinese gooseberries. Central Otago, with its hot summers and severe winters, produces the greater part of the English plums, apricots, and cherries. Because of the prevalence of heavy frosts in spring, orchard heating with firepots has to be provided in most Central Otago orchards.

The following tables show the areas under cultivation and the production of the main fruits in the principal fruit-growing districts:—

TABLE 26—ACREAGES OF PIP, STONE, AND CITRUS FRUITS

North Island

	Kerikeri. Acres.	Auckland. Acres.	Bay of Plenty. Acres.	Hawke's Bay. Acres.
Apples	35	1,140	45	1,435
Pears	15	105	10	370
Peaches	25	620	20	780
Plums	10	405	—	275
Lemons	110	225	210	10
Sweet oranges	220	60	25	—
New Zealand grapefruit	70	290	110	—

South Island

	Nelson and Marlborough. Acres.	Canterbury. Acres.	Central Otago. Acres.
Apples	4,015	900	900
Pears	325	85	125
Peaches	380	75	570
Plums	105	90	125
Apricots	10	100	730
Cherries	20	50	145

TABLE 27—PRODUCTION OF PIP, STONE, AND CITRUS FRUITS, 1950

North Island

	Kerikeri. Bushels.	Auckland. Bushels.	Bay of Plenty. Bushels.	Hawke's Bay. Bushels.
Apples	2,500	319,500	5,500	650,500
Pears	1,500	24,000	2,500	150,000
Peaches	500	50,000	500	135,000
Plums	250	28,250	—	30,750
Lemons	15,500	35,000	83,000	1,200
Sweet oranges	8,250	1,500	2,750	—
New Zealand grapefruit	10,250	70,000	47,000	—

TABLE 27—*continued*

South Island

	Nelson and Marlborough. Bushels.	Canterbury. Bushels.	Central Otago. Bushels.
Apples	1,528,000	166,000	106,500
Pears	105,000	21,000	30,250
Peaches	37,000	4,500	45,500
Plums	3,750	2,500	22,500
Apricots	500	5,250	74,000
Cherries	1,250	3,250	9,500

TABLE 28—ACREAGES AND PRODUCTION OF BERRY FRUITS

	Strawberries.		Raspberries.		Gooseberries.		Currants.	
	Acres.	Tons.	Acres.	Tons.	Acres.	Tons.	Acres.	Tons.
Auckland and Waikato	155	360	—	—	15	25	—	—
Hawke's Bay	15	25	115	200	15	30	15	15
Wairarapa	—	—	70	100	75	210	85	105
Nelson and Marlborough	15	20	200	250	25	20	55	35
Canterbury	75	70	360	350	5	15	20	15

Of the sub-tropical fruits other than citrus, the principal production is of:—

	Tons.
Tree tomatoes	625
Passion fruit	125
Chinese gooseberries	100

The following table sets out the acreage grouping of orchards:—

TABLE 29—NUMBERS AND ACREAGES OF ORCHARDS

Acres.	Number of Orchards in Group.	Acres.	Number of Orchards in Group.
Over 50	10	11 to 15	246
26 to 50	53	6 to 10	542
21 to 25	45	1 to 5	1,118
16 to 20	112		

Of the estimated total production of 2,926,800 bushels of apples in 1950, 1,043,351 bushels were exported, compared with 524,064 bushels in 1949 and 998,000 bushels in 1948. In 1948, 22,000 bushels of pears were also exported.

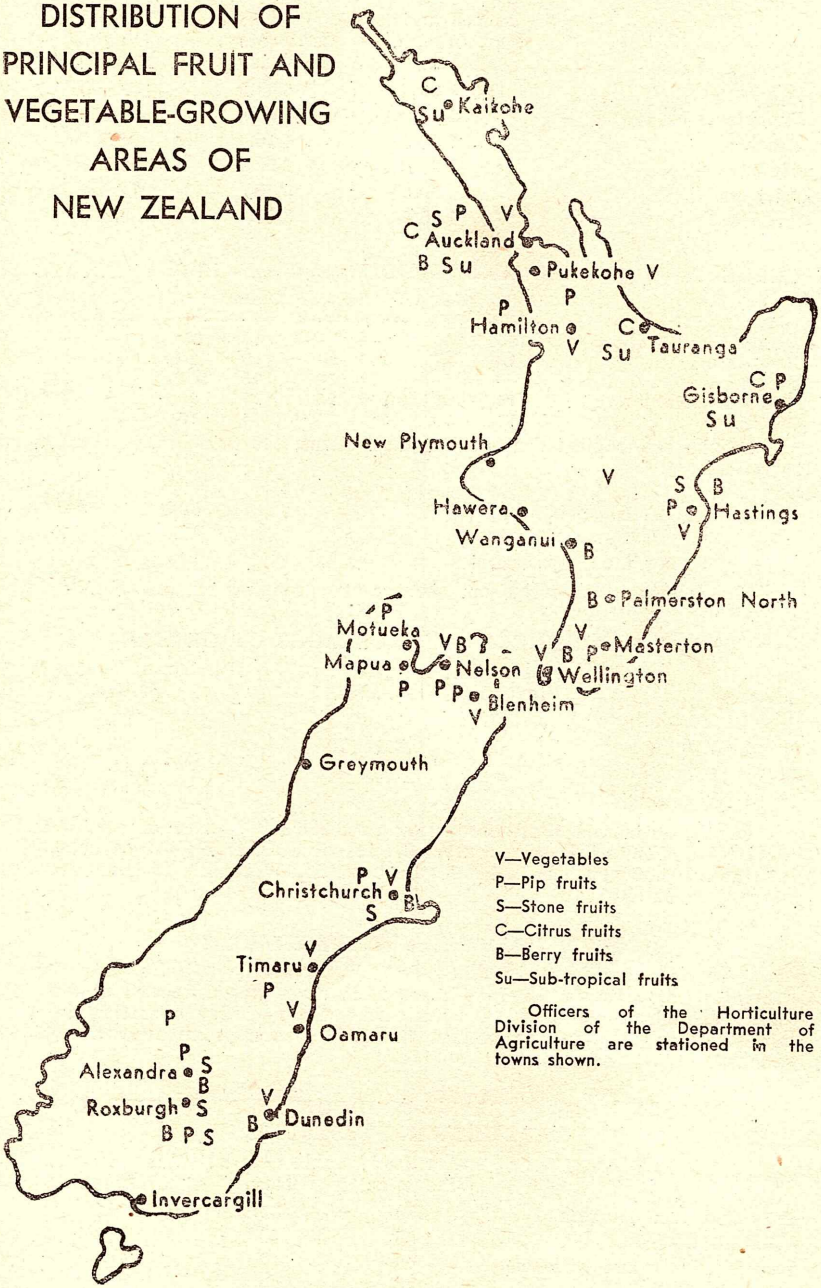
GRAPE-GROWING AND WINEMAKING

Vineyards are located mainly in the Auckland and Hawke's Bay Provinces. Production for 1950 from 1,080 acres was estimated at 3,150 tons. There are 196 licensed winemakers, the majority operating in a small way only. Wine production for 1950 was approximately 600,000 gallons.

TABLE 30—ACREAGES AND PRODUCTION IN PRINCIPAL GRAPE-GROWING DISTRICTS

	Acres of Vineyards.	Table Grapes. Tons.	Wine Grapes. Tons.
Auckland and Northland	570	45	2,000
Waikato	85	40	150
Bay of Plenty and Gisborne	40	5	120
Hawke's Bay	375	30	900

DISTRIBUTION OF PRINCIPAL FRUIT AND VEGETABLE-GROWING AREAS OF NEW ZEALAND



Wine production has increased steadily from 185,000 gallons produced in 1940 to 695,000 gallons (including 85,000 gallons of fruit wine) in 1949.

Approximately 100,000 gallons of cider were produced in 1949, mainly in the South Island.

Over 705,000 square feet of glasshouse space is used for the production of grapes in New Zealand, nearly two-thirds of the glasshouse production being in the Auckland Province.

VEGETABLE-GROWING

The area under commercial cultivation of vegetables has decreased slightly during the past few years and in 1950 was estimated at approximately 18,000 acres. Production is carried out throughout the North and South Islands, but is confined principally to the better-class soils in districts with ready access to the chief centres of population.

In Auckland district outdoor tomatoes may be ripened from December to late May and most of the tomato glasshouses are unheated. In the South Island almost all glasshouses are heated, particularly south of Nelson, and outdoor tomatoes have a much shorter ripening season than in the North Island.

The estimated acreages planted in 1949 in the principal districts with the main staple vegetables (excluding potatoes and onions) were:—

TABLE 31—ACREAGES PLANTED WITH STAPLE VEGETABLES
1949

	Beans.	Cabbages.	Carrots.	Cauli-flowers.	Lettuces.	Peas.	Pumpkins.
Auckland and Pukekohe	150	725	225	600	400	300	325
Hawke's Bay	150	250	150	150	175	325	300
Ohakune	—	100	200	125	—	50	—
Otaki–Levin	50	150	20	175	275	225	50
Christchurch	30	250	75	300	175	200	15
Timaru and Oamaru	20	325	50	375	125	150	—

The area in glasshouses devoted to tomato culture in the principal districts is:—

TABLE 32—AREA IN GLASSHOUSE TOMATOES

	Square Feet		Square Feet.
Whangarei	110,000	Nelson	1,100,000
Auckland	1,300,000	Christchurch	1,855,000
Hawke's Bay	325,000	Oamaru	225,000
Otaki–Levin	150,000		

Approximately 300 tons of asparagus, 450 tons of beans, 5,000 tons of peas, and 11,000 tons of tomatoes were delivered to canning factories in 1949.

FLOWER CULTURE

The commercial production of flowers for New Zealand markets is carried on throughout the year in districts of the North Island where the climate is mild. Production tends to be more seasonal in the South Island. Practically the whole of the flowers for market are produced outdoors.

During the out-of-season periods in the colder districts considerable quantities of flowers are forwarded by ordinary freight and to a less extent by air freight from northern districts.

There is room for expansion of flower production, particularly for specialized production and out-of-season flowers. New Zealand has a small export trade in bulbs which could be developed if production were more specialized and quality were improved.

BEEKEEPING

The trend in beekeeping in recent years has been the gradual expansion and consolidation of commercial units. Expansion has occurred through closer settlement of apiaries in good beekeeping areas and the introduction of beekeeping into country newly opened up for agricultural purposes.

Between 1946 and 1950 the number of registered apiaries increased from 10,457 to 12,121 and the number of hives from 140,703 to 183,982.

The distribution of hives in the various districts is shown in the following table:—

TABLE 33—DISTRIBUTION OF BEEHIVES

District.	Beekeepers.	Apiaries.	Hives.
Auckland	1,721	2,212	23,441
Hamilton	615	1,321	34,684
Tauranga	440	731	14,459
Hastings	846	1,497	18,517
Taranaki	422	875	14,421
Palmerston North	746	1,266	13,931
Nelson	540	789	9,877
Christchurch	449	1,399	20,926
Oamaru	404	1,031	18,174
Invercargill	500	1,000	15,552
Totals	6,683	12,121	183,982

PRODUCTION OF HONEY

Though there are many minor sources of nectar supply, the chief source of the main honey crop is white clover (*Trifolium repens*), which yields white honey from November to February, according to location between north and south and climatic conditions. Beekeeping in bush areas is confined chiefly to the west coast of the South Island, where large quantities of honey are produced from rata (*Metrosideros umbellata*), kamahi (*Weinmannia racemosa*), and from blackberry growing on waste lands. In more open spaces in both the North and South Islands native trees and shrubs yield nectar in varying quantities.

The estimated normal production of honey and commercial beeswax harvested, based on the present number of colonies kept by beekeepers having six hives each or more, is 5,800 tons and 174,000lb. respectively.

ADVISORY SERVICES

The Department of Agriculture, through the Horticultural Division, provides advisory services to the various horticultural industries. Instructors stationed in the main fruit-, vegetable-, flower-, and honey-producing centres give practical instruction. Backing the field instructors is a group of specialists in the Horticulture Division who provide a liaison between the instructor and research workers of the Department of Agriculture and other institutions. The research stations operated by the Horticulture Division are mentioned in the chapter on agricultural research (page 145).

INSPECTION SERVICES

The Horticulture Division of the Department of Agriculture is responsible for the administration of a number of Acts and regulations, chief among which are the Orchard and Garden Diseases Act 1928, the Fireblight Act 1922, the Introduction of Plants Act 1927, the Apiaries Act 1927, the New Zealand Grown Fruit Regulations 1940, and the Importation of Fruit and Plants Regulations 1915.

A plant-quarantine inspection and fumigation service is operated by the Division. All imported fruit and plant material is subjected to rigid inspection at port of entry, and fruit, vegetables, and plant material being exported are also inspected before despatch.

Inspections of orchards, nurseries, market gardens, and fruit and vegetable produce markets are made by horticultural inspectors to ensure that satisfactory disease-control measures are being carried out. Apiary instructors are responsible for the inspection of apiaries for the same purpose.

All apples and pears purchased by the Apple and Pear Marketing Board have to be inspected and passed by horticultural inspectors as conforming to the grades prescribed in the New Zealand Grown Fruit Regulations before being accepted by the Board.

Honey acquired by the Marketing Department for export and local markets is graded by an official honey grader of the Department of Agriculture before acceptance by the Marketing Department.

REGISTRATION AND TAXATION

Regulations provide for the registration of all commercial orchards with fifty fruit-trees or more and of all market gardens of ½ acre and more; commercial apiaries and plant nurseries are also required to register. Plant nurseries pay an annual registration fee of £1.

The chief purpose of registration has been to provide information on the location of orchards, vegetable gardens, apiaries, and nurseries for inspection purposes. Orchardists and market gardeners pay a tax which goes toward the provision of funds for organization purposes of their respective organizations, the New Zealand Fruitgrowers' Federation, Ltd., the Dominion Council of the Commercial Gardeners' Federation, and the Chinese Growers' Federation.

The marketing of horticultural produce is described in the section on marketing.

POULTRY INDUSTRY

UNLIKE most primary industries in New Zealand, the poultry industry does not cater for overseas markets, although small consignments of both eggs and table poultry surplus to local requirements have been exported occasionally. The tendency has been, therefore, for the size of the industry to remain comparatively static over a considerable period, as is indicated by the census figures given in Table 34.

TABLE 34—POULTRY NUMBERS

Census.	Number of Householders Keeping Fowls, Ducks, Geese, or Turkeys.	Total Number of Fowls, Ducks, Geese, or Turkeys.	Fowls.	Ducks.	Geese.	Turkeys.
*1921	145,993	3,991,009	3,491,567	379,988	46,234	73,220
*1926	158,856	3,781,145	3,308,384	352,030	43,879	76,852
†1936	166,354	4,019,076	3,488,516	377,791	66,667	86,102
‡1945	159,333	4,470,356	4,070,673	319,918	41,903	37,862

* April. † March. ‡ September.

It will be noted that the 1945 census was held in spring, a departure from the usual practice of holding censuses in autumn. Undoubtedly the figures for 1945 were inflated to some extent by the inclusion of chickens, September being the height of the normal rearing season. On the other hand, census figures collected in autumn reflect stocks when the annual seasonal culling of laying birds has been completed. Thus the increase of 582,157 in 1945 is more apparent than real. Such increases as have occurred are due in the main to an expanding demand for eggs by an increasing population.

Poultry-farming is confined almost entirely to egg production, but since the Second World War greater attention has been paid to table poultry. Most table birds, however, are still by-products of commercial egg production—surplus spring-reared cockerels and discarded laying birds. Commercial poultry-farms with flocks ranging from 1,000 to 10,000 birds are distributed over both Islands, the largest poultry populations being concentrated around Auckland, Christchurch, and Oamaru. The industry is made up largely of "side-liners" (persons keeping several hundred laying birds as a part-time occupation) and of backyard flocks. These smaller units produce a high proportion of the eggs consumed. Commercial producers, on the other hand, are able to augment their incomes substantially by raising stock to maintain the flocks of the side-liners and householders. Though New Zealand has a very considerable area of grassland, a substantial proportion of the laying flocks are run successfully on the intensive system—that is, confined to laying-houses without grass runs. Generally commercial poultry-farms occupy comparatively small areas and are often close to cities. The intensive system tends to reduce labour requirements, and units of 1,000 to 1,500 maintained by a family without employed labour are common.

Duck-egg farming is carried on only to a limited extent and is centred around Auckland mainly. Duck eggs are not popular, particularly during hot weather, and in consequence duck-farming has not developed. There is little organized turkey production, though there are a few fairly large breeding flocks in Central Otago.

BREEDS OF POULTRY

The breed most favoured for egg production is the White Leghorn, there being a marked preponderance of these birds, particulaly in the South Island. There is a growing tendency, however, in the North Island to increase the flocks of Australorps and Rhode Island Reds. Khaki Campbell and Runner ducks mainly are used for egg production. Khaki Campbell, Muscovy, and some Pekin ducks are marketed as table birds.

Poultry Flock Improvement Plan

In 1945 the poultry industry, assisted by the Department of Agriculture, established the New Zealand Poultry Flock Improvement Plan. Under this plan, operated on an entirely voluntary basis and controlled by a Dominion committee composed of poultry-breeders and officers of the Department, breeding stock are accredited if they measure up to reasonable standards of health, constitution, and type. Recently the plan has been expanded to include the recording of egg production for sample flocks of pullets bred from accredited stock. The plan does not permit breeding from pullets to provide purebred stock, though pullets may be used for producing cross-bred laying birds. The number of flocks accredited each year has remained static for the past three years, but the number of female birds accredited has risen each year (see Table 35).

TABLE 35—DOMINION TOTALS OF ACCREDITED STOCK

Year.	Number of Flocks.	Number of Female Birds.	Year.	Number of Flocks.	Number of Female Birds.
1945	28	5,508	1949	169	46,613
1946	71	15,428	1950	164	55,750
1947	105	26,783	1951	163	63,434
1948	142	41,862			

A list of accredited flock owners is published annually.

WORK OF DEPARTMENT OF AGRICULTURE

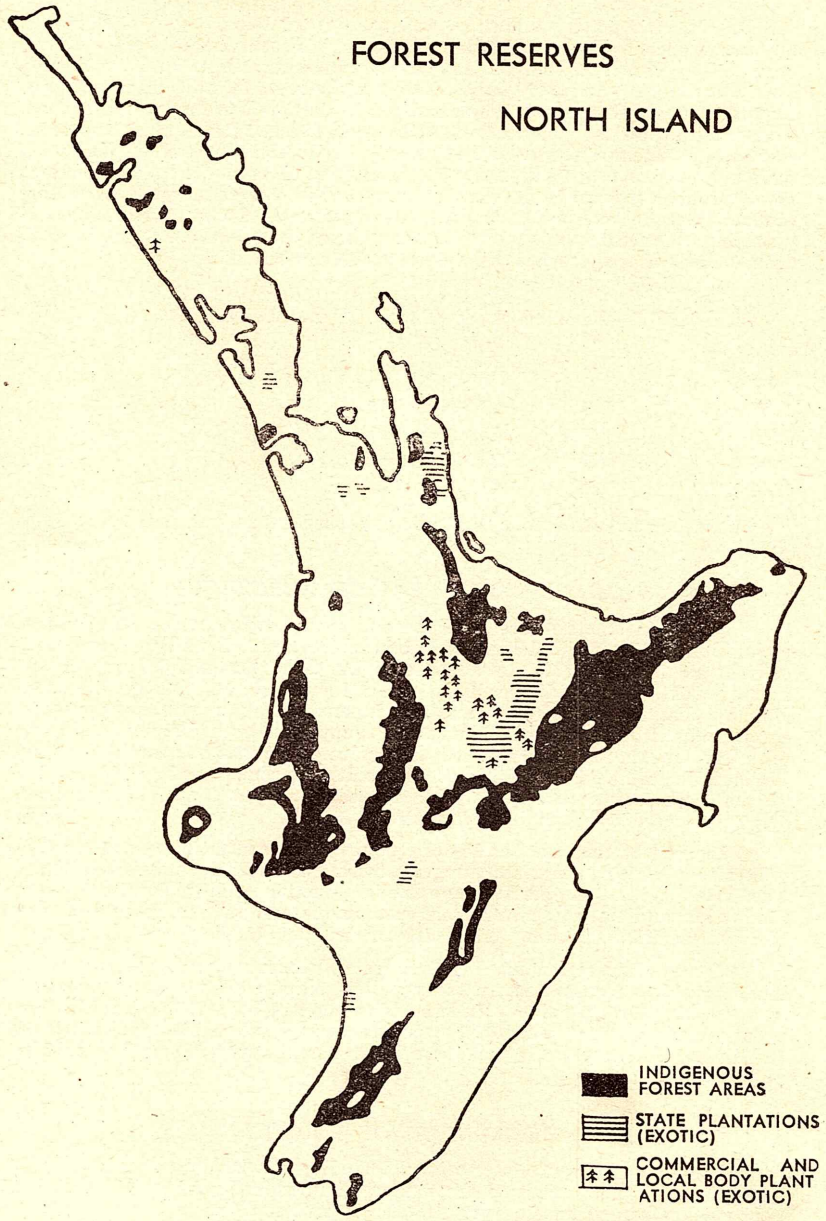
Poultry instructors are stationed in five main centres of poultry population in the North Island and four in the South Island to provide an efficient advisory service, to administer the New Zealand Poultry Flock Improvement Plan, and to assist in the control of poultry diseases. Poultry disease control methods are supervised by a veterinary officer specializing in poultry pathology, who is supported by a diagnostic service provided by the Department of Agriculture Animal Research Station, Wallaceville, which is available to all poultry producers. In 1951 officers of the Department were responsible for carrying out 200,000 blood tests for pullorum disease on breeding birds.

The Department has a 15-acre poultry demonstration plant twenty miles from Wellington where progeny testing is carried out with Australorps and White Leghorns to establish strains giving improved egg production and having better resistance to disease, in particular leucosis-resistant strains. Feeding trials are carried out at the plant.

A recent innovation has been the establishment of a breeders' laying trial, in which breeders have twenty pullets trapnested for egg production and checked for egg size. Pullets obtaining a specified standard in egg production, egg size, and breed type are accredited as birds suitable for breeding. At present the trial can cater for thirty-five pens for twenty pullets each.

IMPORTATION OF POULTRY

The importation of live poultry, including fowls, ducks, turkeys, and geese, is prohibited owing to the danger of introducing into the Dominion poultry diseases such as laryngo-tracheitis and fowl pest. As a measure of protection against the latter disease, hatching eggs may not be imported from any country other than Australia, where to date this disease has not been reported. Any hatching eggs from Australia must be accompanied by a veterinary certificate indicating that the consignment has come from stock in good health and tested for pullorum disease.



Drawn by the Head Office, Department of Lands and Survey, Wellington.

FORESTRY AND FOREST PRODUCTS

UNDER primitive conditions 72 per cent of the area of New Zealand was covered with forest and scrub. Nearly half of this land has since been converted to agricultural uses, mostly by burning off and sowing grass seed in the resultant ash. Much of this conversion was inevitable and justified, but the destruction of forests undoubtedly went too far on the poorer and steeper land, with the result that some areas have become unstable and uneconomical as farm land and are now a national liability through accelerated erosion and flooding of the fertile lowlands. Further, the millions of acres of forests destroyed could be a priceless asset to-day.

STATUS OF FORESTS TO-DAY

About 14 million acres of indigenous forest remain, but it is not known just what quantities of marketable timbers this area contains. The State Forest Service is at present engaged in a systematic survey, using the two techniques of aerial photograph interpretation and statistical analysis. The 1947 Annual Report of the State Forest Service stated:—

> "If successfully completed the forest survey should provide the most important document in the history of New Zealand's timber use economy for the next 50 years; of more lasting value, the ecological information gathered should help toward the formulation of a policy which will have reference not only to 50, but to 500 or even 1,000 years ahead."

To understand something of the position of New Zealand forests to-day it is necessary to sketch briefly the development of organized forest conservation in New Zealand. Toward the end of the last century realization began to dawn that forest resources were not by any means inexhaustible and that almost irreparable damage was being done by indiscriminate and even wanton destruction. It was not until 1919, however, that a separate Department of Forestry was formed. This was followed by the Forests Act of 1921–22 which laid the foundation of an effective forest policy, which may be summarized thus:—

(1) To ensure ample timber supplies for both the present and the future population of New Zealand.

(2) To protect and regulate stream-flow by maintaining protection forests at the headwaters of all important streams.

(3) To maintain productive forests on non-agricultural areas which, if de-forested, might be turned into impoverished wastes.

(4) To transfer to forest management all existing and future forests on which stream-flow, soil fertility, climate, and public health depend.

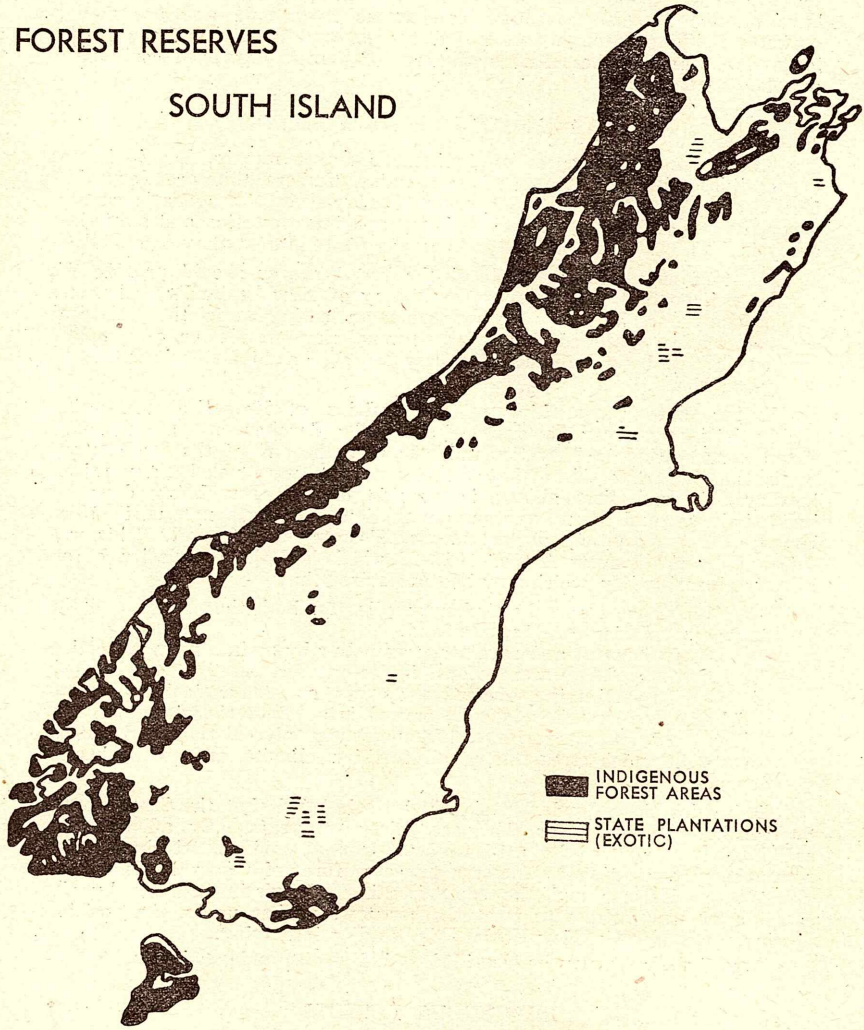
It is with these fundamental principles in mind that the State Forest Service has operated over the past thirty-two years. By adopting an enlightened policy in the utilization of forest produce, which includes permanently dedicating to forestry purposes forested Crown lands unsuitable for agriculture and the supplementing of existing forests by the creation of new forests to meet the country's timber needs, the position or forest resources in New Zealand is steadily improving.

Areas of forest may be classified as indigenous and exotic.

INDIGENOUS FORESTS

Indigenous forests are mainly under the control of the Crown and are further classified as follows:—

State Forests: 6,000,000 acres (1,500,000 in 1921) which are permanently dedicated to soil protection or controlled timber production.



Drawn at the Head Office, Department of Lands and Survey, Wellington.

Provisional State Forests: 3,000,000 acres (5,000,000 in 1921) which are administered as State forests, but suitable areas may be released for settlement purposes. The reduction in area since 1921 is due primarily to transfers to the State forest category.

Other Crown Forests: 2,500,000 acres, which include national parks, scenic reserves, and educational endowment reserves.

Forests Not Controlled by Crown: 4,000,000 acres, which are "standing native bush" or unimproved occupied lands.

EXOTIC FORESTS

Exotic forests may be classified as follows:—

	Approximate Area. Acres.
State forests	450,000
Private commercial forests (belonging to proprietary companies)	300,000
Municipal and private plantations	100,000

The indigenous forests belong, as a whole, to that great division of the earth's vegetation called rain forest—a community with its most extreme development in the tropics. New Zealand rain forest may be divided naturally into two classes: sub-tropical rain forest and sub-antarctic rain forest, the former being a mixed community of broad-leaved trees and conifers, and the latter a pure community of one or more of the species of beech (*Nothofagus*). Between these two classes there are many intermediates, the one graduating into the other.

In regard to appraisal of timber, rain forest proper is divided into the following groups: The kauri (extending northward from a line joining Port Waikato to Tauranga); the rimu (throughout the North, South, and Stewart Islands—its heaviest stands in the central part of the North Island, and on the west coast of the South Island); the kahikatea (throughout North and South Islands and occupying low-lying, swampy ground), and the totara (throughout New Zealand, but mainly in the central part of the North Island).

Beech forest must be divided into milling forest and protection forest, the former consisting of: (1) Forest where hard beech (*Nothofagus truncata*) and the black beech (*Nothofagus solanderi*) are present in quantity, or where there is only the latter (this extends from the south of latitude 38 degrees southward to northern Nelson, Marlborough, and eastern Canterbury). (2) Forest where the silver beech (*Nothofagus menziesi*) and the red beech (*Nothofagus fusca*) are either the sole or the principal species; they extend from the Thames mountains through the montane and lower sub-alpine belts southward to north-west Nelson, Westland (but absent from the Taramakau River southward for 100 miles), and the fiord country of Otago. (3) Forests where the silver beech is pure or nearly so. These occur principally in southern and western Southland, and extend over the western slopes of the dividing range.

Protection forest where beeches predominate, particularly the mountain beech (*Nothofagus cliffortioides*), is essentially high mountain forest, but on Mount Egmont and on the western side of the Southern Alps, from somewhat north of the Taramakau River for more than 100 miles southward, beeches are absent. The forest is modified rain forest proper with thin bark totara (*Podocarpus halli*) and kaikawaka (*Libocedrus bidwilli*) as important trees.

In addition to the high forests there are scrub forests, of which those made up of manuka are commercially important on account of the value of their wood for fuel, and because, in many instances, they are an early stage of rain forest.

Though there are about 112 New Zealand forest tree species, only a few are of value as timber trees; in fact, at present only six are being used to any extent by sawmillers. Of these, five are conifers (kauri, rimu, kahikatea or white pine, matai, totara) and one (beech) is a hardwood.

It is important to realize that more than 80 per cent of New Zealand's indigenous forests are technically over-mature. In other words, there is an abnormally high proportion of mature or old, defective trees which hinder the development of young crops. This is, in any country, a natural characteristic of primeval forest. The conversion of these over-mature forests into healthy growing crops producing to the maximum capacity will necessitate silvicultural management over at least one hundred years. The current timber demands are depleting indigenous forests at such a rate that, unless other provision is made, an adequate supply of timber is unlikely to be available during the whole of the intervening period. To meet this situation it has been necessary to create new forests of fast-growing species. No indigenous species is sufficiently fast-growing or adaptable for this purpose, but several forest trees of the Northern Hemisphere, principally *Pinus radiata,* are suitable and have been planted extensively. Although the total area of exotic forests appears small relative to that of total indigenous forests (900,000 acres as against 14,000,000), the exotic forests are now of considerable importance as a source of timber as is shown in Table 36). In 1920 *Pinus radiata* was sixth on the production list and provided only 3 per cent of the total. By 1938 it was second only to rimu and represented 13 per cent of the total. For 1950–51 it was still second, but now provides 34·8 per cent of the total.

The following table shows the output of the principal timbers milled at five-year intervals from 1920 to 1950. (Quantities are quoted in board measure feet—superficial feet—units of 12in. × 12in. × 1in.):—

TABLE 36—OUTPUT AND CONSUMPTION OF TIMBER

Species of Timber.	1919–20. Board Feet (Thousands).	1919–20. Percentage of Total.	1924–25. Board Feet (Thousands).	1924–25. Percentage of Total.	1929–30. Board Feet (Thousands).	1929–30. Percentage of Total.	1934–35. Board Feet (Thousands).	1934–35. Percentage of Total.
Rimu	141,825	47·1	195,573	56·8	163,293	57·8	125,488	51·5
Kahikatea	81,370	27·0	65,572	19·1	58,506	20·7	52,294	21·5
Matai	17,762	5·9	23,948	7·0	17,972	6·4	13,880	5·7
Kauri	26,095	8·7	22,891	6·6	10,471	3·7	5,553	2·3
Totara	20,507	6·8	18,510	5·4	9,046	3·2	8,868	3·6
Beech	3,435	1·1	6,836	2·0	10,225	3·6	7,725	3·2
Pinus radiata (insignis)...	5,868	2·0	7,706	2·2	10,382	3·7	27,311	11·2
Other and unspecified	4,214	1·4	3,059	0·9	2,510	0·9	2,663	1·0
	301,076		344,095		282,405		243,782	

Species of Timber.	1939–40. Board Feet (Thousands).	1939–40. Percentage of Total.	1944–45. Board Feet (Thousands).	1944–45. Percentage of Total.	1949–50. Board Feet (Thousands).	1949–50. Percentage of Total.	1950–51. Board Feet (Thousands).	1950–51. Percentage of Total.
Rimu	207,097	61·6	181,931	53·5	227,051*	47·5	229,180*	43·6
Kahikatea	33,043	9·8	17,990	5·3	20,066	4·2	20,050	3·8
Matai	21,212	6·3	19,181	5·6	32,829	6·9	36,810	7·0
Kauri	5,065	1·5	2,878	0·8	819	0·1	1,050	0·2
Totara	10,882	3·3	11,253	3·3	12,840	2·7	13,440	2·6
Beech	9,008	2·7	11,074	3·3	17,167	3·6	17,610	3·4
Pinus radiata (insignis)...	46,762	13·9	85,713	25·2	146,537	30·6	182,910	34·8
Other and unspecified	2,922	0·9	10,113	3·0	21,073	4·41	24,370	4·6
	335,991		340,133		478,382		525,420	

* Includes miro.

In addition to the six indigenous trees included in the table there are other timbers, such as puriri, kohekohe, and pukatea, which have very high qualities but which are now to be obtained only in such small quantities that they are of little commercial importance. The following is a short description of each of the main timber-producing varieties:—

Rimu or Red Pine (*Dacrydium cupressinum*): This, the principal timber tree of the New Zealand forest, is to be found more or less in all forests except the pure beech forests. The average height is about 80ft. and the average diameter about 30in. The timber is reddish when first cut, seasoning to a reddish-brown. It is fairly straight in the grain, easily worked, and is the chief timber used in housebuilding. It is often beautifully marked and is then used for furniture, doors, and panelling.

Kauri (*Agathis australis*): This is the largest tree of the New Zealand forest, and as far as volume of timber is concerned it is also one of the largest trees in the world. The average height of the kauri is about 100ft. The maximum diameter which has been measured is 22ft., and a few trees exist with diameters of 14ft. The average diameter is, however, about 40in. It grows only north of 38 degrees south latitude. The timber is light yellowish-brown; it is straight in the grain, strong, easily worked, and remarkably free from knots and defects. Kauri was formerly much used for housebuilding, but because of its present high price it is now used only for railway carriage and boat building and cabinet and general joinery purposes. Mottled and figured kauri is much prized for cabinet work. The kauri yields a very valuable resin called kauri-gum which, together with phormium, constituted New Zealand's earliest exports. Unfortunately, stands of this valuable tree are now very limited and the State has taken active steps to conserve some of the main kauri blocks.

Kahikatea or White Pine (*Podocarpus dacrydioides*): This tree occurs to some extent in all forests of both islands, except the beech forests; formerly it was found in almost pure stands in swampy areas, but most of these stands have now been exploited. The average height of the tree is about 120ft. and the average diameter about 32in. The sapwood, which comprises the greater part of the log, is white, and the heartwood yellow. The timber is straight in the grain and easily worked, and long, clean lengths and broad widths can be obtained. The yellow heartwood is durable, but the sapwood is very susceptible to the attacks of the larvæ of the white-pine borer. The timber is inodorous and is at present used mainly for butter-boxes, cheese crates, and other packages.

Totara (*Podocarpus totara* and *P. halli*): These trees, which are very closely related and hybridize freely, extend throughout all three islands, though in many localities the totara is rare. It is most plentiful in the forests of the central portion of the North Island. The average height is about 80ft. and the average diameter about 30in. The timber is reddish when first cut, seasoning to a reddish-brown. It is straight in the grain, easily worked, but somewhat brittle. Its great durability has caused it to be much used for railway sleepers, wharf piles, telegraph poles, and posts. Its high price and its freedom from warping and shrinking are now, however, causing it to be used for such special purposes as window and door frames, veranda posts, and steps.

Matai or Black Pine (*Podocarpus spicatus*): This tree occurs more or less plentifully throughout New Zealand. Its average height is about 60ft. and the average diameter about 24in. The timber is light yellowish-brown, straight in the grain, and easily worked. It is very durable out of the ground and is used chiefly for weather-boarding, exterior joinery, and flooring, and for the last-mentioned purpose is one of the best timbers in the world.

Beech (*Nothofagus*): There are four varieties of beech in commercial use, black beech (*N. Solanderi*), hard beech (*N. truncata*), red beech (*N. fusca*), and silver beech (*N. Menziesi*). All are distributed widely, but are more common in the South Island. Black beech is used only for fencing posts and firewood, but red and hard beech are used for posts, mine props, and to a small extent for sleepers and bridge work. They are

also used for furniture and bentwood work, and with the increasing scarcity of Australian hardwoods are certain to have a much more extended use in the future. Silver beech is not so durable in contact with the ground, but is used for flooring, furniture, casks, tool handles, and various types of packing cases and crates.

Pinus radiata: *Pinus radiata* now accounts for about 35 per cent of the timber milled. This is being used for a variety of purposes such as box shooks, boxing for concrete construction, and, of recent years, for ordinary building purposes where the timber is not in contact with the ground or any other moisture. The State Forest Service has for some years been experimenting with wood preservatives and has discovered that the creosotes constitute by far the most effective and economical means of treatment. It is hoped that by preserving exotic timbers they will be suitable for use as posts, railway sleepers, piles, &c., as the supply of suitable moisture-resistant timbers such as puriri and totara is becoming very short. Supplies of timber creosoted during the past four years were as follows (all in cubic feet):—

1947.	1948.	1949.	1950.	1951.
68,000	48,000	139,000	235,000	303,000

IMPORTS AND EXPORTS

In the early days, when the supply of indigenous timbers seemed virtually inexhaustible, there were considerable exports of kauri and later of rimu and white pine. With the depletion of supplies, exports gradually decreased, as will be seen from the table below. Some exports of timber, however, are necessary, even at present, when supplies of building timber are so short, in order that supplies of Australian hardwoods necessary for sleepers, power and telegraph poles, &c., may be obtained from Australia. In addition, New Zealand has, in the past, procured supplies of Oregon pine (Douglas fir) from Canada and the U.S.A. This was used principally by builders engaged in the construction of factories, public buildings, and schools.

TABLE 37—EXPORTS OF SAWN TIMBER (calendar years)

Board feet thousands

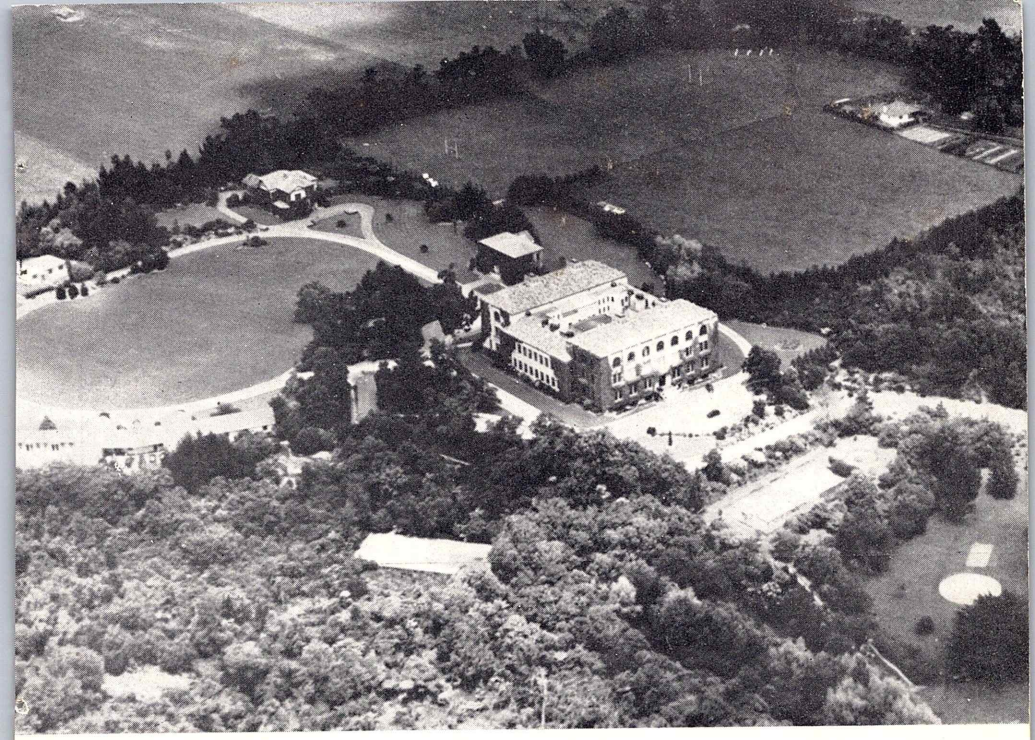
	1925.	1930.	1935.	1940.	1945.	1950.
Kahikatea	39,748	19,178	22,709	732	38	906
Rimu	3,710	3,501	9,009	11,808	690	2,259
Beech	2,221	1,974	2,766	1,575	927	395
Matai	—	—	2,842	747	75	580
Kauri	3,239	1,088	627	174	19	—
Pinus radiata	—	—	1,607	1,578	1,824	9,026
Other N.Z.	286	929	25	708	560	138
Totals	49,204	26,670	39,585	17,322	4,133	13,304

TABLE 38—IMPORTS OF SAWN TIMBER (calendar years)

Board feet thousands

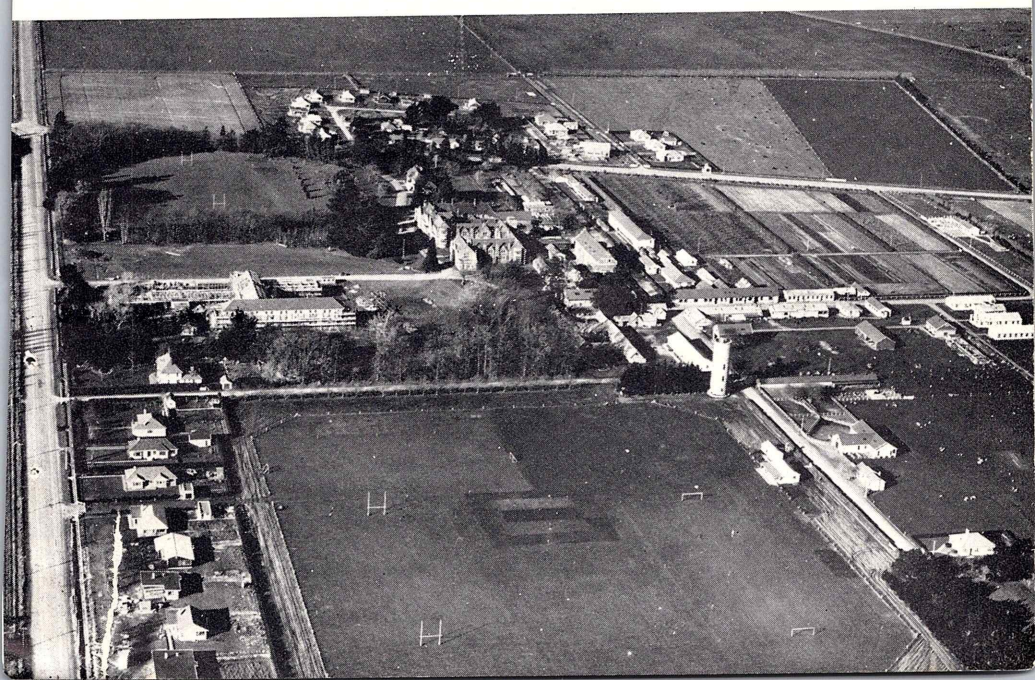
	1925–30.		1935–40.		1945–50.	
Australian hardwoods	23,190	13,615	8,087	8,175	6,451	9,631
Douglas fir	17,116	12,807	3,472	1,820	3,750	7,620
Totals	40,306	26,422	11,559	9,995	10,201	17,251
Sleepers (number)	461,790	547,288	512,450	74,773	3,253*	399,167

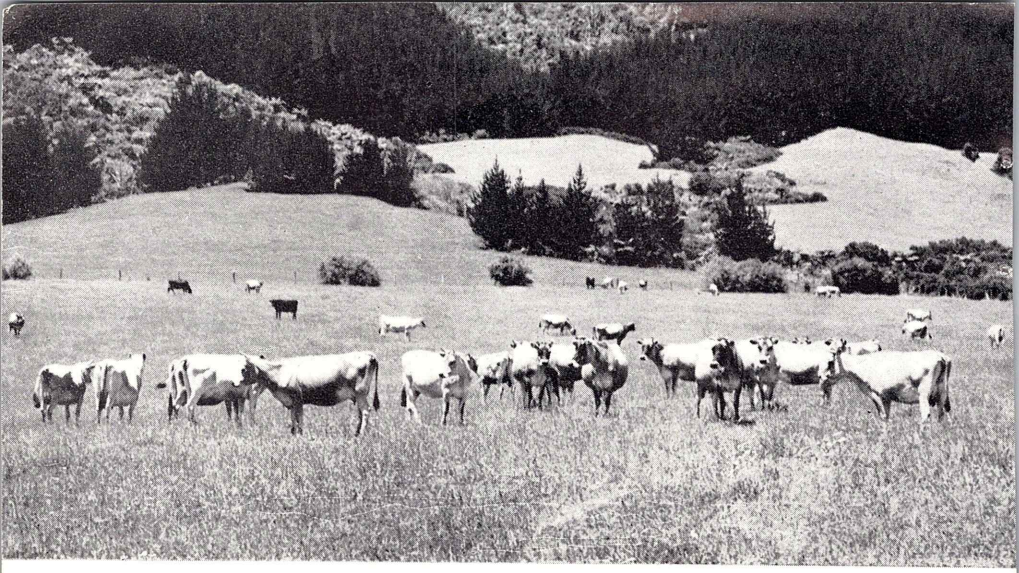
* Board feet thousands.



Buildings and grounds at New Zealand's two agricultural colleges, Massey Agricultural College, Palmerston North (above), and Canterbury Agricultural College, Lincoln (below).

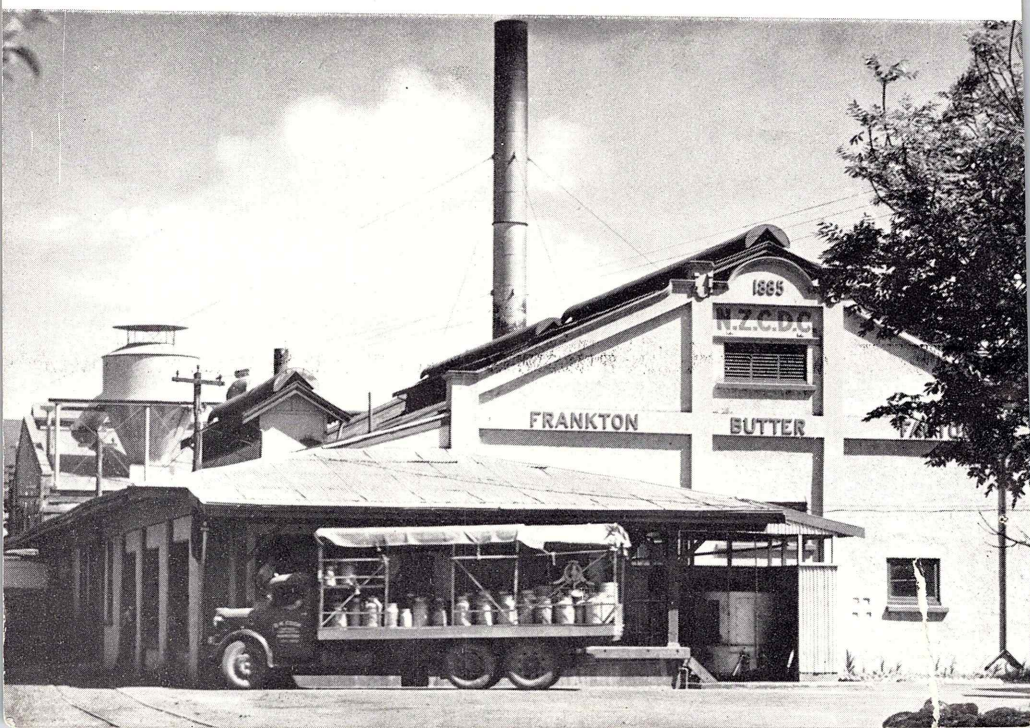
[*V. C. Browne photo.*

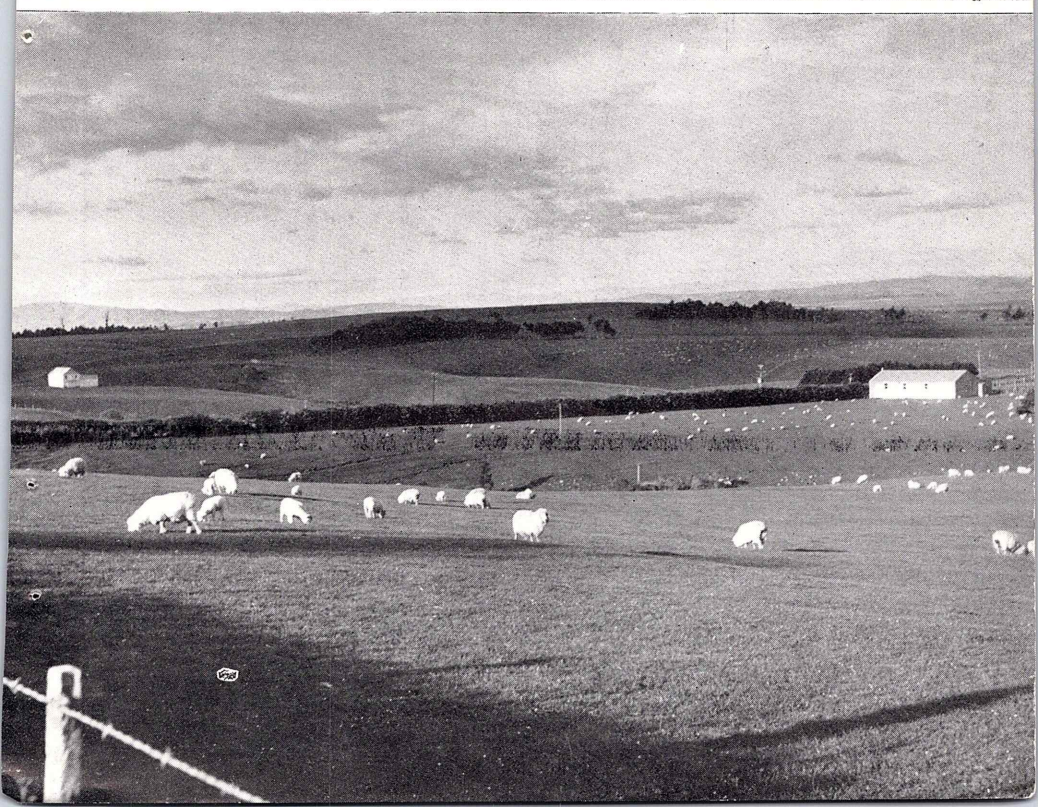


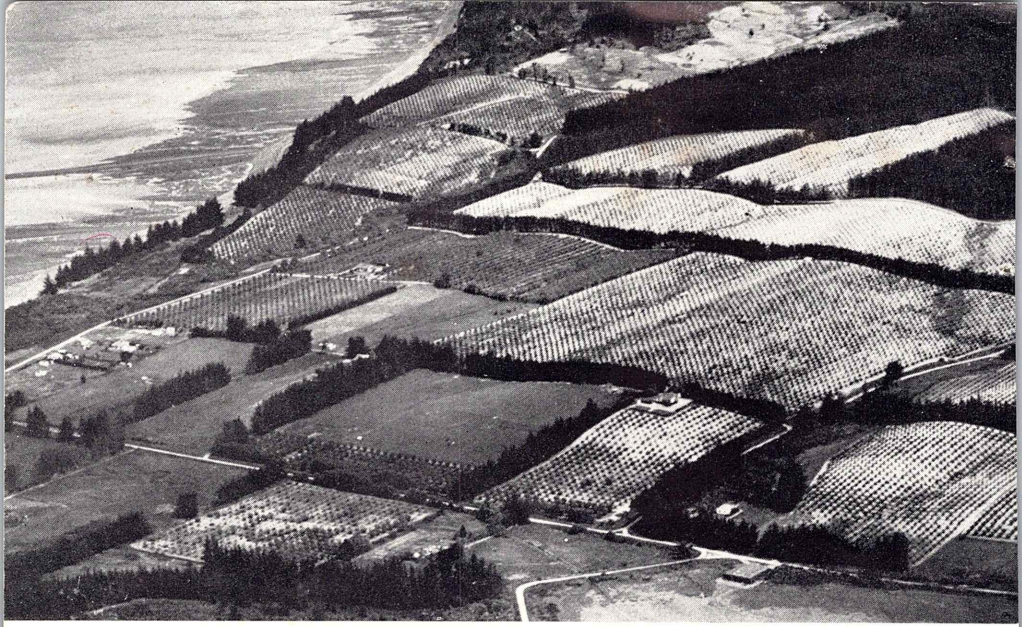


Above—Dairy herd on a Taranaki farm. Total estimated butterfat production for New Zealand for the 1951–52 season was about 500,000,000 lb., of which about 85 per cent was used by factories manufacturing butter or cheese. Below—A Waikato butter-factory. Outputs from individual factories are as high as 6,000 tons per year for butter and 1,600 tons for cheese. Opposite—Fat-lamb farmers do not usually maintain breeding flocks, but buy annual drafts of ewes from farmers on the hill country, either by private sale or at ewe fairs (above). Production of fat lambs is a major activity on much of the intensively farmed land (below).

[*Photos above and above opposite by National Publicity Studios; photo below opposite by Sparrow Industrial Pictures Ltd.*







[*V. C. Browne photo.*

Above—Orchards on land bordering Tasman Bay, Nelson. Nelson is the principal apple-growing area of New Zealand. Below—Investigations of problems affecting all branches of primary industry are undertaken at various institutions. The illustration shows a research worker at the Department of Agriculture Animal Research Station, Wallaceville, using apparatus for the artificial insemination of queen bees.

NEW ZEALAND'S FISHERIES

THOUGH New Zealand is surrounded by very large areas of water, these seas, contrary to general belief, do not abound in fish; not, at least, edible fish in a form easily caught and marketed.

In 1934–35, 331,415cwt. of "wet fish" (all ordinary fishes caught by all methods of fishing in the sea) with a value of £294,267 were landed at the various New Zealand ports. By 1939–40 the quantity of fish had increased only to 339,231cwt. and the value to £416,480. The reason for this was that it was costing more to land fish because fish were becoming harder to catch.

The fishing industry has found it necessary to invest in larger, more powerful boats equipped with modernized fishing gear of increased catching power, and to make much longer voyages than were made previously. This has necessarily involved considerably increased capital expenditure and working costs which have not been reflected in increased quantities of fish landed. In fact, the tendency is in the other direction, and as time goes on it becomes necessary to use more power, more time, and more efficient gear to keep supplies at about the same level as was formerly obtained with appreciably less trouble and expenditure. This process has necessarily resulted in some depletion of the fishing-grounds, and active steps have had to be taken to conserve fish.

Since the end of the war the quantity of fish caught has increased considerably owing to the return of several large catching units after war service and the refitting of many vessels. Quantities of wet fish caught rose from 331,773cwt. in 1945 to 449,903cwt. in 1949, but declined again to 440,179cwt. in 1950. This decline was to be expected when the fishing-grounds, after having had a period of comparative rest during the war, were subject to increased exploitation. Moreover, the number of fishing-vessels operating fell from 855 in 1949 to 841 in 1950 and the number of men engaged in the industry declined from 2,355 to 2,249.

The estimated total quantity and value of the principal classes of fishery products marketed in 1950 (calendar year) were:—

TABLE 39—QUANTITY AND VALUE OF FISH PRODUCTS

	Quantity.	Value.
		£
Wet fish	440,179 cwt.	918,051
Whitebait	1,962 cwt.	48,537
Oysters—		
Dredged	75,048 sacks	75,048
Rock	5,136 sacks	8,984
Mussels	13,657 sacks	5,587
Crayfish	52,482 cwt.	169,038
Whale oil	474 tons	19,000
Fish livers	815,493 lb.	37,376
		£1,281,621

There are from thirty to forty species of fish featuring in the commercial trade in New Zealand, but the bulk of the fish caught fall into about seven main varieties, snapper, tarakihi, hapuku (groper), gurnard, sole, blue cod, and flounder, of which snapper and tarakihi are the most abundant, constituting more than 50 per cent of the total catch.

The average quantity of wet fish landed over the past six years was 414,457cwt., the proportions of each of the main species being similar to those for the years quoted in Table 40. Of the total catch for 1950, 78,363cwt. (18 per cent) was landed from steam trawlers and 192,424cwt. (44 per cent) from motor trawlers. Line and net fishing accounted for 126,634cwt. (28 per cent), and Danish seining for 42,758cwt. (10 per cent). The quantity of fish caught by Danish seining has decreased rapidly from 88,980cwt. in 1948 to 42,758cwt. in 1950, as there has been a change-over to motor trawling. The chief fishing ports are Auckland (where 28 per cent of the total catch was landed in 1950), Wellington (11 per cent), and Port Chalmers (9 per cent).

DISTRIBUTION OF EDIBLE FISH AND WHALES

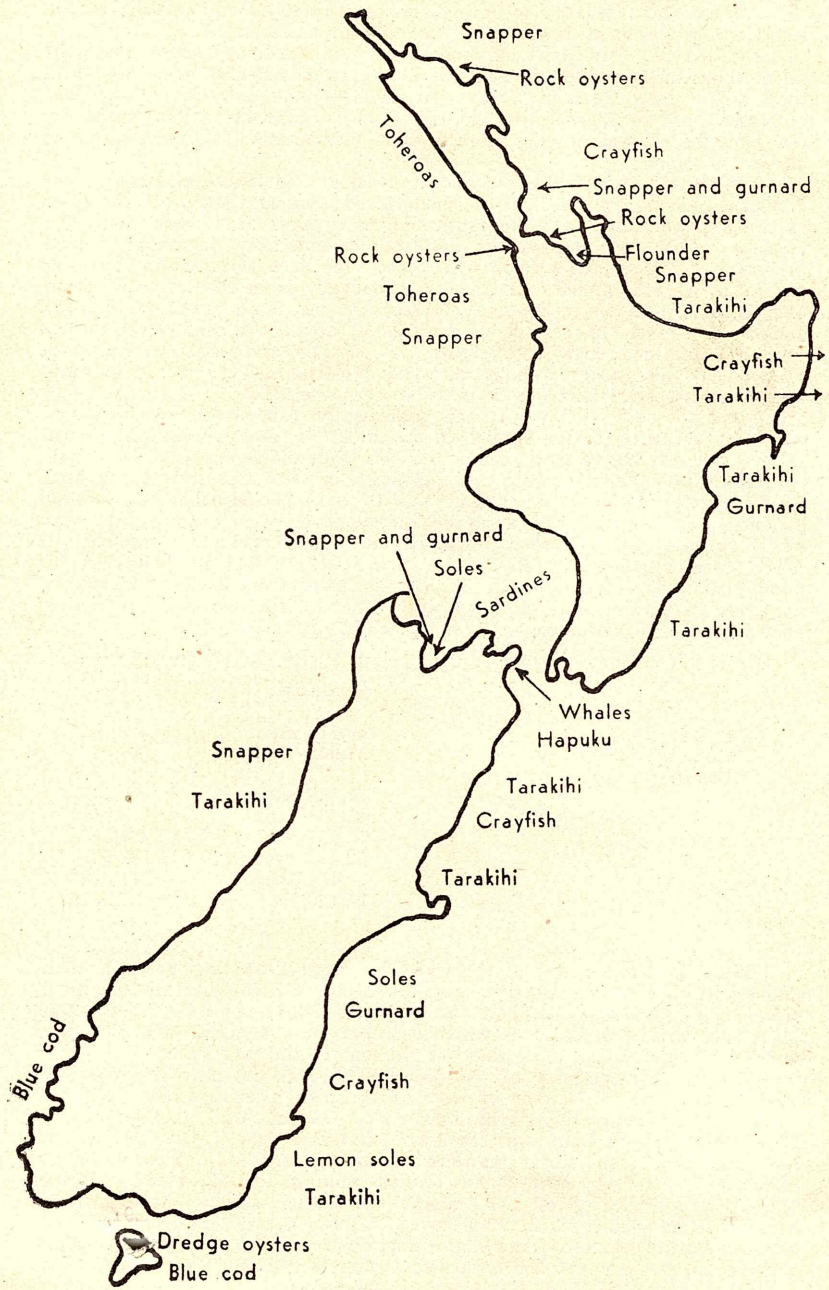


TABLE 40—MAIN VARIETIES OF FISH CAUGHT

	1945. cwt.	1946. cwt.	1950. cwt.
Snapper	109,009	116,832	122,595
Tarakihi	63,829	77,927	108,771
Hapuku	21,672	27,522	33,650
Gurnard	20,354	24,168	25,895
Sole	17,990	22,434	23,105
Blue cod	19,160	21,036	32,688
Flounder	16,070	14,442	14,903
All other	63,689	75,960	78,572
	331,773	380,321	440,179

Whaling: New Zealand was the centre of whaling operations long before there was any colonization or settlement, and whaling, based on the Marlborough Sounds, is still carried on. The catch varies, of course, from year to year, but from 400 to 700 tons of oil is produced annually.

Sardines: A small sardine-canning factory which operated at Picton was closed in 1950.

Fish-liver Oil: The development of the utilization of fishery by-products hitherto wasted is an industry which developed as a result of the war, when overseas supplies of important vitamin-content oils were in danger of being cut off. In particular the extraction of oil from sharks' livers has been developed and it has been discovered that this oil is particularly rich in vitamin A, but rather poor in vitamin D. Consequently quite a big export of this oil has been built up. During 1950, 815,493lb. of fish livers were treated, yielding 37,544 gallons of oil. Exports for the year were 17,440 gallons. (This figure is not comparable with previous years, as it includes varying quantities of concentrates.)

Oysters: The bulk of the oysters produced are dredge oysters obtained from Foveaux Strait. Quantities obtained vary from 60,000 to 90,000 sacks per season. Rock oysters are picked in various parts of the Hauraki Gulf and North Auckland. The quantity obtained in 1950 was about 5,000 sacks. The Fisheries Section of the Marine Department maintains and develops these beds of rock oysters by destroying borers and pupu and clearing rock of all shell and, of course, by restricting picking to certain periods and to authorized pickers.

Other Products: Other fish products marketed in moderate quantities are whitebait, mussels, crayfish, and toheroas. At present only one company is canning toheroas. Toheroa is the Maori name for a mollusc which is found principally in beds in the sands of certain beaches on the west coast of the North Island and is considered a great delicacy, especially for soup-making. Excessive digging for these shellfish on some of the beds has seriously depleted their numbers and the Fisheries Section of the Marine Department has for some years taken active steps to conserve and build up existing beds.

IMPORTS AND EXPORTS

External trade in fish is not very great. Imports consist entirely of tinned fish such as herring and salmon and exports consist principally of frozen fish and tinned shellfish. Imports of canned and preserved fish amounted to 53,471cwt. in 1950. In 1939 they were 42,154cwt.

TABLE 41—EXPORTS OF FISH

	1948.	1949.	1950.
Oysters, fresh (doz.)	1,020	1,920	630
Fish, frozen (cwt.)	54,671	61,367	60,958
Crayfish, frozen (cwt.)	3,731	6,388	11,814
Fish, smoked, dried, &c. (cwt.)	1,625	1,047	615
Fish and shellfish, tinned (lb.)	755,507	798,955	291,188

Frozen fish is exported to Australia and constitutes, on the average, only about 6 per cent of total production.

NUTRITION

NEW ZEALAND adopts the tentative nutritional standards proposed by recognized authorities, such as the League of Nations Technical Commission's standards, and the recommended allowances of the National Research Council of the U.S.A., as revised in 1945.

As is only to be expected in a young farming country the average New Zealander almost invariably has had a reasonably high standard of living as far as consumption of food and standard of housing are concerned. It is probable that during the severe economic depression of the 1930's some families were not in receipt of sufficient income to enable them to attain an optimum diet, but very rarely was the deficit sufficiently great as to cause any serious degree of malnutrition, though no survey was made. In any case, the period of hardship was relatively short.

New Zealand has done a little toward finding out the extent to which the dietary intake conforms to nutritional standards. Pre-war nutritional studies were limited in scope, but revealed that the chief deficiencies were iron, iodine, calcium, and vitamin B_1. Consumption of milk, cheese, eggs, unrefined cereals, green vegetables, and raw fruits and vegetables was lower than desirable and food sources of vitamin D rather lacking. Meat, butter, and sugar were consumed in more than recommended amounts.

Iron intake is frequently below the average standard considered desirable. Apart from the pathological cases, shortage of this element shows up, as is to be expected from metabolic studies, in the susceptible groups only : Children, adolescents, and women, especially expectant and nursing mothers. Recent studies on each of these groups show that in a proportion of the subjects an anæmia exists, for example, in about 12 per cent of expectant mothers and in about 15 per cent of school-children in the groups studied.

Lack of iodine and the incidence of endemic goitre have presented a major health problem in New Zealand. Studies conducted by Hercus and co-workers have advanced the knowledge of this subject in respect both to the preventive and to the curative aspects and the work has represented a contribution to the world knowledge of this disease. Before the adequate iodization of salt goitre was extremely prevalent in some areas. In some schools 60 to 70 per cent of children were found to have goitre; in others the figures were much lower, but the average reported by school medical officers as being affected was about one-third of the total number of school-children. In 1940 iodization of salt was increased from 1 part of potassium iodide to 250,000 to 1 to 20,000 and the Health Department carried out extensive publicity to encourage the use of iodized salt. As a result the incidence of goitre in school-children fell from 15 per cent in 1938 to 2·5 per cent in 1950.

Because of the low intake of milk and cheese, the calcium intake frequently falls below the optimum. However, there has been a considerable increase in milk consumption over the past few years, from 0·5 pint per head per day in 1935 to 0·9 pint in 1949. The milk-in-schools scheme has no doubt played an important part in popularizing milk.

Some years ago studies showed that vitamin B factors were not taken in optimal amounts and endeavours were being made to introduce a higher extraction rate for flour. When the world food crisis demanded that New Zealand should assist in alleviating the shortage of grain, a high extraction rate (80 per cent of the weight of wheat) was provided for under a Government order of May 1946. This was reduced to 78 per cent in 1949, and at present bread made with this flour provides almost double the quantity of vitamin B_1 provided by the pre-1946 white loaf (73 per cent extraction flour). Some troubles have been experienced in baking, but these have been accentuated mainly by grain which has sprouted or has been attacked by the wheat bug. In some cases imported grain has been of the best quality for baking. New Zealand has no policy of fortification of flour with synthetic vitamins or minerals.

Diet deficiencies that have occurred and are still to be found in New Zealand are due primarily to the poor choice and preparation of food rather than to any economic factor, as the available evidence indicates that New Zealanders spend sufficient money on food to provide an adequate diet. On a calorie and protein basis the consumption of the main foodstuffs is indicated by the following figures from the Food and Agriculture Organization Food Balance Sheets (1949):—

Foodstuff.	Calories Per Day.
Cereals	933·2
Roots and tubers	104·1
Sugar	563·2
Fats	387·3
Pulses and nuts	54·8
Fruit and vegetables	152·2
Meat	648·5
Milk	485·3
Fish	17·3
Eggs	54·4
Total	3,400·3

Grams protein per day: Animal, 65; vegetable, 35.

It should be noted that the amounts quoted are at the retail level and do not necessarily indicate actual consumption, because of wastage involved in the preparation and consumption of food, generally a fairly high rate where the standard of living is high. Comparable figures are available for 1948–49 only, at which time Ireland had the highest calorie consumption. The following countries had consumptions of over 3,100 calories: Ireland, New Zealand, Argentina, Australia, and U.S.A.

The chief evidence of unsatisfactory nutrition is seen in New Zealand in—

(*a*) Prevalence of goitre.

(*b*) Widespread dental caries; about 96 to 97 per cent of people are affected.

(*c*) An anaemia in a certain proportion of children and expectant mothers.

(*d*) Some evidence of B_1 deficiency in vulnerable groups, such as expectant mothers.

INFANT NUTRITION

The main agency at work supervising the nutrition of infants is the Royal New Zealand Society for the Health of Women and Children (the Plunket Society). In 1949–50, out of a total of 43,988 children born, 85 per cent came under the society's supervision. The infant mortality rate has shown a steady decline, from 74·8 per 1,000 live births in 1901–5 to 22·75 in 1950. The 1948 rate of 21·9 was the lowest on record.

EDUCATION ON FOOD NEEDS

It is apparent that dietetic errors occur more through lack of knowledge and through dietary habits than through penury. For that reason it is necessary to educate the public to better habits—a notoriously difficult task. The agencies connected with this education in New Zealand are:—

(*a*) The Department of Health, which has a nutritionist and three dietitians. The Department's activities include the education of school-children by school medical officers and school nurses; publicity work consisting of radio talks, poster displays, and advertisements in papers; a travelling exhibit supervised by the Department's dietitian, and accompanied by films, models, and posters; newspaper articles by the Department's nutritionist; lectures to post-graduate nurses; and booklets for the use of classes in domestic science in the primary and secondary schools, or for the guidance of mothers.

(*b*) The Dental Division of the Department of Health, whose school dental nurses give instruction to parents and children on the care of teeth.

(*c*) Home science teachers in schools, colleges, and manual-training centres.

(*d*) Teachers of hygiene in the four teachers' training colleges.

(*e*) The Association for Country Education and the Workers' Education Association.

(*f*) The nurses of the Plunket Society.

TABLE 42—CONSUMPTION OF FOOD

	Unit.	Pre-war.	1948 or 1949.
Whole milk	Pint	220·0	330·0
Cream	Pint	6·9	*
Ice-cream	Pint	3·2	12·0
Cheese	lb.	4·5	6·4
Butter	lb.	41·0	30·6
Milk powder and condensed milk	lb.	5·0	8·6
Beef	lb.	112·0	106·1
Veal	lb.	7·5	6·0
Mutton	lb.	60·0	63·4
Lamb	lb.	6·5	8·9
Pork, including chopper meat	lb.	9·0	10·8
Ham and bacon	lb.	17·0	23·5
Edible offal	lb.	9·0	9·0
Potatoes	lb.	130·0	130·0
Kumaras	lb.	7·5	7·5
Cabbages and greens	lb.	100·0	100·0
Carrots	lb.	30·0	30·0
Tomatoes	lb.	20·0	20·0
Apples	lb.	44·0	46·0
Pears and quinces	lb.	6·0	9·3
Stone-fruits	lb.	12·5	16·5
Citrus fruits	lb.	23·0	19·0
Bananas	lb.	21·0	14·9
Pineapples	lb.	1·0	0·7
Poultry	lb.	3·9	4·0
Fresh fish, edible portion	lb.	11·0	14·1
Shell fish, edible portion	lb.	0·9	1·2
Eggs	dozen	20·0	18·0
Honey	lb.	2·1	5·7
Refined sugar	lb.	106·0	111·3
Dried peas and beans	lb.	1·6	3·8
Flour, wheaten	lb.	185·0	185·0
Cornflour	lb.	2·4	1·1
Oatmeal, oaten products	lb.	10·5	7·4
Rice	lb.	5·3	1·4
Tea	lb.	6·8	6·7
Cocoa	lb.	1·0	1·0
Beer	Gallons	10·8	17·3
Grape wine	Gallons	0·2	0·4
Spirits	Proof gallons	0·3	0·2
Tobacco	lb.	3·9	4·8

* Available for restricted class of consumers only.

More recent figures for butter and meat show that by 1950 consumption of butter had almost reached pre-war levels and consumption of meat was higher.

FOOD CONSUMPTION

The actual consumption of food in New Zealand is indicated by Table 42. The figures are, in most cases, only approximate. As is natural in a farming country, a fairly large proportion of the population live in the country or on the fringe of the towns and cities. Under those circumstances food consumption for many items is partly an estimate. No allowance has been made for the produce of home gardens. Again, it must be remembered that the amounts of foodstuffs are those available for consumption. Actual consumption is certain to be less because of wastage in preparation and consumption.

IMPROVEMENTS IN NUTRITION

No post-war dietary surveys have been undertaken, nor has there been any study relating detailed clinical findings to food intake. Systems at present in operation for bringing about improvements in nutrition are:—

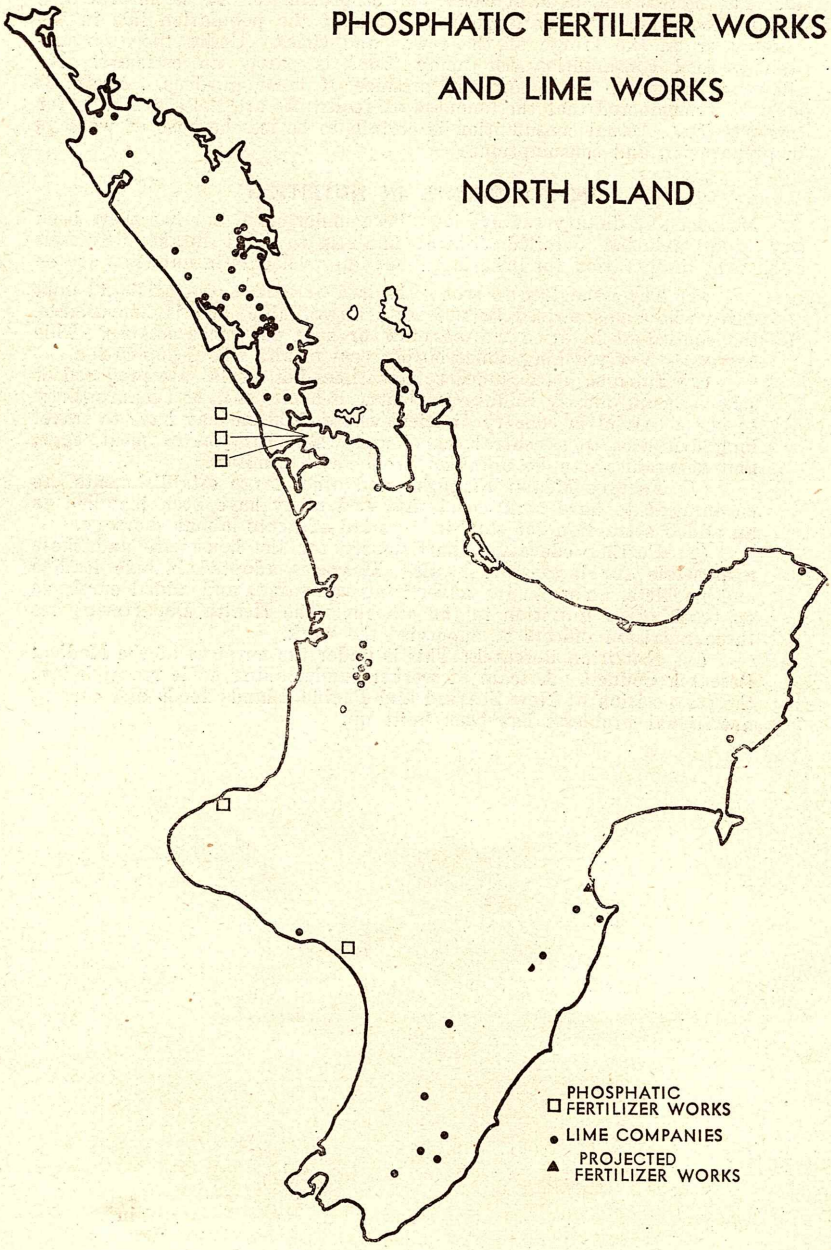
(1) The issue free to school-children of half a pint of liquid milk daily where pasteurized bottled milk is available, and if unavailable, the equivalent in dried malted milk, or milk for cocoa-making. This service is now reaching about 90 per cent of the school population.

(2) In some places lunches (sometimes hot meals) are prepared at schools, using mostly voluntary labour. Schemes such as this are likely to be successful in country districts where children may have to travel long distances to a central school and where supplies of meat, eggs, and vegetables can be obtained from farm families.

(3) Factory Meals: Factories and other large establishments are encouraged to have staff cafeterias, and many have been installed as an added attraction for staff in a period of acute labour shortage.

(4) Further education, particularly for the housewife and those responsible for large-scale meals. Measures adopted include leaflets and booklets, an extensive advertising campaign, and added emphasis on teaching of nutrition in the schools. The Health Department has three nutrition officers to supervise the work.

(5) Nutrition Research: This is under the auspices of the Medical Research Council. A team of workers undertaking basic research into the composition of New Zealand and Pacific Islands foods and current nutritional problems has been built up.


PHOSPHATIC FERTILIZER WORKS
AND LIME WORKS
NORTH ISLAND
PHOSPHATIC FERTILIZER WORKS
LIME COMPANIES
PROJECTED FERTILIZER WORKS

FERTILIZER AND LIME INDUSTRIES

THE importance of the top-dressing of pastures with lime and fertilizers has been stressed already. There are relatively few areas in New Zealand where pastures or crops can be grown satisfactorily without phosphatic fertilizers. Potash, on the other hand, is used only to a minor extent. Nevertheless, signs of potash deficiency are appearing to an increasing extent in the important dairying districts of the North Island, particularly in Taranaki, Bay of Plenty, Waikato, Rotorua, and Auckland. For this reason, use of this fertilizer is certain to expand in the next few years. Nitrogen, the last of the three major fertilizers, does not play a great part in agricultural production in New Zealand. Partly due to its high price and partly because its use on pastures and crops demands exact timing and very skilled utilization, nitrogen is applied only sparingly and by few farmers. Phosphates are therefore the main fertilizers used, and manufacture in New Zealand is confined to superphosphate and superphosphate derivatives. Apart from mineral fertilizers, 25,000 to 35,000 tons of organic by-products of the freezing industry and allied industries are made which contain some nitrogen as well as phosphorus.

SUPERPHOSPHATE

The principal phosphatic fertilizer used is locally manufactured superphosphate. There are five manufacturing companies and eight manufacturing plants all operating the ordinary sulphuric acid process of manufacture. The fertilizer-manufacturing companies are public limited-liability companies, and the finished product is sold by them direct to farmers or to merchants or dairy companies who deliver to farmers.

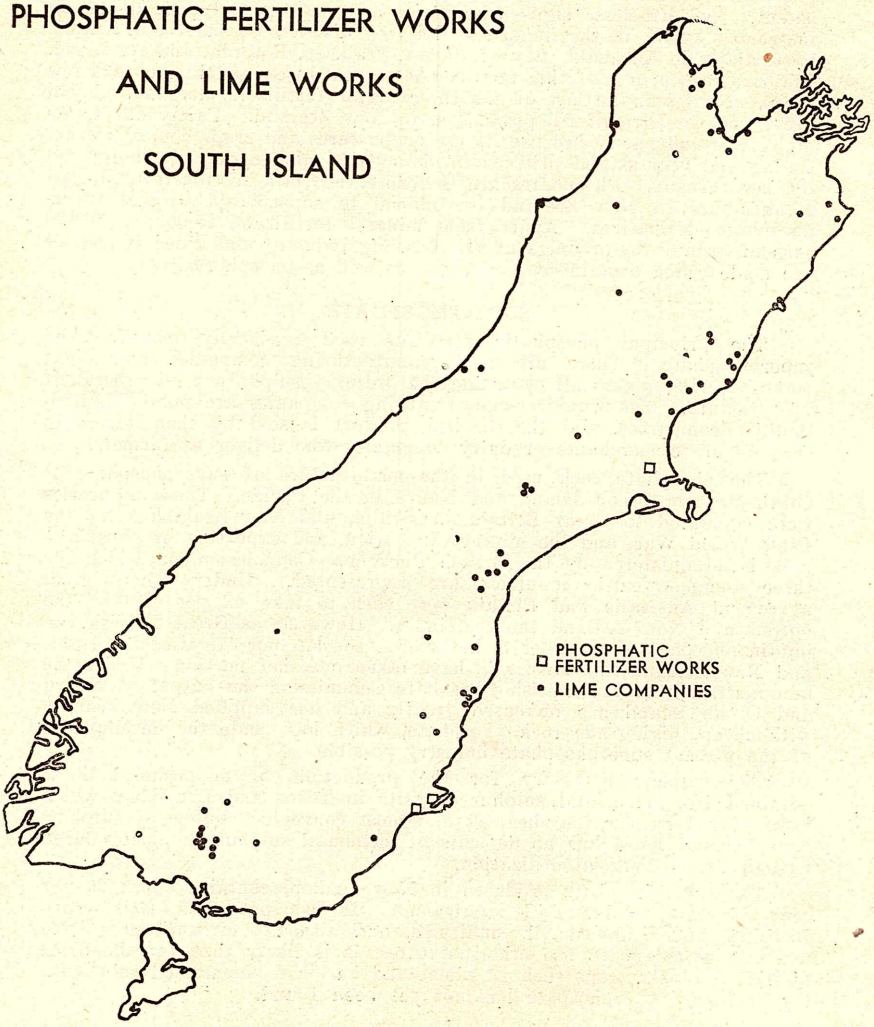
The phosphate rock used in the manufacture of superphosphate is obtained from Ocean Island and Nauru in the Pacific. These territories were mandated to Great Britain, Australia, and New Zealand after the First World War, and the mining, allocation, and exporting of phosphate rock is administered by the British Phosphate Commission, on which the three Commonwealth countries are represented. Under the original agreement Australia and Britain were each to take 42 per cent of the output and New Zealand the remainder. However, as Great Britain can obtain phosphate rock closer to her shores, she has not exercised her right, and New Zealand and Australia have taken over her portion Under the administration of the British Phosphate Commission the output of Nauru and Ocean Island has increased greatly and has supplied New Zealand with cheap, high-grade rock phosphate, which has made the development of the present superphosphate industry possible.

The sulphur necessary for the production of superphosphate is obtained from elemental sulphur deposits in Texas and Louisiana, which have proved by far the cheapest and most convenient source of sulphur. New Zealand itself has no deposits of elemental sulphur or pyrites large enough for commercial utilization.

The superphosphate produced in New Zealand contains about 20 per cent of water-soluble P_2O_5 equivalent. It has proved a satisfactory fertilizer under almost all conditions, and although circumstances have made it necessary to use other mixtures, it is likely that for the drier districts and for crops such as wheat and barley a commercial substitute for ordinary superphospate has not yet been found.

SERPENTINE SUPERPHOSPHATE

Since 1940 serpentine superphosphate has been produced commercially. It is a mixture of 3 parts of freshly made superphosphate with 1 part of ground serpentine rock. It contains most of its phosphorus in a citric-acid-soluble form, does not deteriorate under storage, and does not cause germination injuries if sown with seed. Its physical properties, therefore, are superior to those of superphosphate. Despite the lower phosphorus


PHOSPHATIC FERTILIZER WORKS
AND LIME WORKS
SOUTH ISLAND
PHOSPHATIC FERTILIZER WORKS
LIME COMPANIES

content of serpentine superphosphate, trials and general practical experience indicate that weight for weight it is as efficient as superphosphate for pasture top-dressing in most parts of New Zealand. It has proved particularly efficient in the Waihi and Taranaki districts and on certain volcanic soils of Northland. In September 1942 fertilizer manufacturers in the North Island were strongly recommended to convert all superphosphate into serpentine superphosphate to make the most of the small supplies of phosphate rock which could be imported at that time. In the South Island, however, the manufacture of very large quantities of serpentine superphosphate did not appear practicable and a lime-reverted superphosphate to a large extent took the place of serpentine superphosphate and ordinary superphosphate. At first lime-reverted superphosphate was used mainly with brassica crops, because it did not reduce germination when sown with the seed. It is now applied in considerable quantities on pastures, where it seems to be efficient, particularly on lime-responsive soils.

The most important use of organic fertilizers is for horticultural crops, but it is likely that up to 25 per cent of the output is used in fertilizer mixtures for field crops. Other phosphatic fertilizers such as basic slag, ground North African rock phosphate, and guanos are or were imported into New Zealand in fairly large quantities.

The largest imports of high-class basic slag from Belgium were made just before and after the 1930–34 financial depression. Since then its price has risen slowly, and from being as cheap as or cheaper than superphosphate it has become very much more expensive. Consequently its use has declined. It gives best results on soils which are lime responsive, and for this reason it can be replaced economically by superphosphate combined with heavy applications of lime.

North African rock phosphate in general gives slightly smaller pasture responses than basic slag and is used on the same type of soils. To a minor extent it is incorporated in special fertilizer mixtures prepared by merchants. The so-called guanos imported into New Zealand are soft rock phosphates containing no nitrogen; at present they are used mainly in proprietary mixtures. In the past, particularly before large-scale superphosphate manufacture was begun, large quantities of guano were used on pastures and supplementary crops. Little is known of their relative merit for pasture and crop production, but it is thought that they compare quite favourably with soft North African rock phosphate.

For some ten years a small plant at Huntly, in the North Island, produced a phosphate known as Heskett slag by fusing Nauru rock phosphate with dolomite, but eventually it failed to withstand the competition of susidized basic slag and North African soft rock phosphate and production ceased in 1950.

FERTILIZER CONSUMPTION IN LAST TWENTY-FIVE YEARS

Table 43 shows the amount of fertilizers which were available during the last twenty-five years. It reveals most strikingly the relatively insignificant part which mineral potash and nitrogenous fertilizers have played in New Zealand agriculture in the past.

Though the quantity of phosphatic fertilizers used has increased almost threefold in the last twenty-five years, progress has not been regular, but has been disrupted by a major depression, the Second World War, and recently the world shortage of elemental sulphur.

In the three years preceding the 1930–34 depression the prices of superphosphate and other phosphatic fertilizers were fairly low compared with prices received for primary produce. At that time much evidence was also available that economic pasture production without phosphatic fertilizers was not possible on most soils, and this fact was widely appreciated. A rapid rise in demand caused almost a doubling of consumption in four years; in Taranaki, for instance, three times as much land was top-dressed in 1930–31 as in 1926–27.

As the depression developed in 1930 the relation of prices of phosphatic fertilizers to those of farm produce gradually became more unfavourable. In fact, fertilizer prices did not fall much, and from 1932 onward a small but variable subsidy was paid to superphosphate manufacturers. Though this measure may have been very helpful, it did not arrest the rapid decline in consumption. In the true dairying districts of the North Island, however, the contraction in demand was not so large as in some of the sheep-farming districts. When farm produce prices began to rise after the depression the price of superphosphate continued to fall slightly while that of other imported phosphatic fertilizers increased. In consequence, the deferred demand for phosphates was mainly directed toward superphosphate at the expense of the other fertilizers, which never recovered the position which they had occupied before the depression.

INTERRUPTION OF SUPPLY FROM NAURU AND OCEAN ISLAND

When from the beginning of 1942 Japanese action prevented shipments of Nauru and Ocean Island rock, the British Phosphate Commission obtained considerable though inadequate supplies of rock phosphate from Florida, North Africa, and Makatea Island near New Caledonia. Fertilizer rationing had to be introduced, and in September 1942 the industry was persuaded to sell almost all superphosphate in the form of serpentine superphosphate or reverted superphosphate. Hence the figures shown in Table 43 for the years 1942 to 1946 probably are almost 25 per cent lower than the quantities of superphosphate mixtures applied by farmers. This partly explains why the acreage of grassland top-dressed (Table 45) has not declined as much as could be expected, even if allowance is made for lighter per-acre applications.

RESTORATION OF NAURU AND OCEAN ISLAND PLANT

After the war steadily increasing prices for primary produce created a very strong demand for phosphatic fertilizers, and though since 1946 fairly large quantities of superphosphate and superphosphate mixtures became available and the import of other phosphatic fertilizer increased, rationing had to be continued until July 1949. By this time the damaged or destroyed plant on Nauru and Ocean Island had been rebuilt and the shipping link with New Zealand had been restored. From 1949 to 1951 imports of other phosphatic fertilizers were also encouraged by a subsidy, 85 per cent of which was subscribed from produce pool funds. These subsidies were not continued in 1951, and increases in original costs and shipping charges have now raised the landed cost of imported phosphatic fertilizers to a point where purchases are likely to be restricted.

WORLD SULPHUR SHORTAGE

The world shortage of elemental sulphur has affected the volume of superphosphate production. Early in 1951 an International Materials Conference was set up in Washington, U.S.A., and the sulphur committee of that conference, on which New Zealand was represented, allocates supplies in quarterly quotas. In 1951 New Zealand received about 66,000 tons, compared with an estimated 90,000 tons which New Zealand intended to use so that the maximum capacity of 775,000 tons of superphosphate could be fully utilized and the demand for phosphatic fertilizers met as far as possible. As a preferable alternative to rationing, farmers, manufacturers, and others agreed to a bulking-up scheme to increase the quantity of phosphatic fertilizers in a manner similar to that adopted during the war. At present, therefore, it has been agreed to suspend the sale of ordinary superphosphate and to replace it by four mixtures. In the North Island they are serpentine superphosphate or a blend of 15 parts superphosphate, 3 parts of ground Nauru rock phosphate, and 2 parts of serpentine rock. In the South Island lime is taking the place of serpentine rock; otherwise the proportions are the same. By these means it is estimated that 730,000 tons of superphosphate mixtures were provided in 1951.

THE LIME INDUSTRY

The beneficial effect of lime, particularly in certain districts, was recognized as far back as the 1880's. By 1930 it had been demonstrated that on almost all soils of the South Island heavy initial applications of lime were necessary to obtain best results from superphosphate. In the North Island most soils derived from volcanic ash do not respond to liming or respond only slightly, but soils derived from sedimentary and volcanic rocks in Northland and the Auckland Province and all but the best alluvial soils and dry hill soils of the Wellington Province and the east coast districts must be limed to obtain satisfactory production. On lime-responsive soils initial dressings, to be efficient, seldom are less than 1 ton per acre; annual maintenance dressings vary from 2cwt. to 5cwt. per acre.

Finely ground limestone rock containing 60 to 90 per cent of calcium carbonate is about the only form of lime which is used in agriculture. Table 44 illustrates the large increase in the production of agricultural limestone over the last twenty-five years. The 1930–34 slump had only a slightly depressing effect on the use of lime, and, due to the shortage of phosphatic fertilizers, a large increase in the demand for lime occurred at the beginning of the Second World War. It appears, therefore, that farmers tend to substitute lime for fertilizers when an ample supply of the latter is, for some reason or another, out of reach of the ordinary farmer. There are at present about 120 limeworks in operation.

SUBSIDIES ON FERTILIZERS AND LIME

Farm production, particularly of pastoral products, is so important in the national economy that successive Governments have made every effort to encourage farmers to make the greatest possible use of fertilizers and lime.

A direct subsidy on the price of superphospate was paid from 1932 to 1947. Before the war the amount was not very great, but it reached a substantial sum as a result of wartime inflation. At that time, however, a large proportion of the cost was paid from the produce pool amounts. In 1947 it was removed and, where possible, farm produce prices were increased correspondingly. At the same time a transport subsidy on railage of fertilizers was removed also. From 1949 to 1951 there was a subsidy on imported phosphatic fertilizers such as basic slag and North African phosphate, because the prices of these fertilizers were much higher than that of superphosphate, of which there was still insufficient to meet the demand. Of the cost of this subsidy 85 per cent was recovered from the produce pool accounts and the balance from the Consolidated Fund, these proportions representing very roughly the proportions of farm produce exported and consumed locally.

The main subsidies at present operating relate to transport rather than the product, particularly with lime, because the cost of the product is very low in relation to transport charges, which without some measure of subsidy might restrict use of lime.

After the war the railway system became overtaxed because of the increasing volume of goods of many kinds that were then offering and because of the need to give priority to certain types of commodities (for example, to meet overseas shipping requirements) and to facilitate the transport of items such as coal and timber. It was impossible to meet fully the rail transport requirements for fertilizers. To overcome this difficulty the Government introduced a system under which the Railways Department used private road and sea transport, when necessary, to cart fertilizers for intermediate distances, usually from 30 to 100 miles with road haulage, the difference between the road or sea transport costs and the normal rail charge being met by the Consolidated Fund. It is estimated that the total cost to the Consolidated Fund for this purpose during the calendar year 1951 would be some £240,000. This subsidy, is, of course, to the Railways Department rather than on fertilizer.

TABLE 43—FERTILIZER AVAILABLE FOR USE IN NEW ZEALAND FARMING

Season.	* Superphosphate (Straight). Tons.	† Other Phosphates. Tons.	‡ Blood and Bone, Blood, Bone, &c. Tons.	Potashes, Sulphate Ammonia, Nitrate Soda. Tons.	Total. Tons.
1926–27	187,761	71,814	19,768§	12,648	291,991
1927–28	295,919	66,487	21,331§	8,009	391,746
1928–29	275,488	151,249	24,746§	13,701	465,184
1929–30	299,327	183,555	24,031	18,992	525,905
1930–31	234,220	125,266	25,340	17,814	402,640
1931–32	231,078	97,021	22,556	9,157	359,812
1932–33	307,224	59,480	26,115	10,513	403,332
1933–34	280,418	64,266	24,001	7,490	376,175
1934–35	313,924	25,305	23,021	11,178	373,428
1935–36	331,029	54,895	25,234	15,242	426,400
1936–37	370,178	92,337	25,338	15,027	502,880
1937–38	447,407	120,862	21,676	21,371	611,316
1938–39	461,572	107,291	23,535	21,990	614,388
1939–40	511,570	111,896	26,684	22,461	672,611
1940–41	616,108	79,436	29,846	11,748	737,138
1941–42	332,462	67,630	32,221	4,085	436,398
1942–43	250,234	46,144	34,828	5,194	336,400
1943–44	263,665	19,502	29,512	4,881	317,560
1944–45	392,379	49,014	28,913	6,339	476,645
1945–46	470,059	44,793	32,021	10,675	559,548
1946–47	537,773	62,168	33,596	6,201	639,738
1947–48	561,222	97,064	30,158	10,127	698,571
1948–49	579,799	101,493	29,121	5,202	715,615
1949–50	625,493	100,652	31,643	11,048	768,836
1950–51	606,637	137,236	N.A.	N.A.	N.A.

* To 1939–40 assessed from the rock phosphate shown as used in "Factory Production" to eliminate other fertilizers mixed with it.

† From and including 1940–41 fertilizers containing fused phosphate rock have been included in "other phosphates."

‡ Assessed from "Factory Production" by an arbitrary method to eliminate chemical fertilizers mixed with them.

§ Owing to alterations in the basis of the Census and Statistics Department's returns, these years are not strictly comparable with those in subsequent years.

N.A. = Not available.

TABLE 44—LIME PRODUCED FOR AGRICULTURAL PURPOSES*

Calendar Year.	Tons.	Calendar Year.	Tons.
1928	182,949	1940	593,995
1929	221,756	1941	728,474
1930	204,811	1942	613,168
1931	171,159	1943	752,603
1932	201,735	1944	903,808
1933	191,888	1945	812,635
1934	261,940	1946	929,794
1935	288,559	1947	1,020,810
1936	317,055	1948	1,091,299
1937	410,770	1949	1,100,129
1938	481,712	1950	1,259,759
1939	391,069		

* From annual reports of Mines Department.

	N.Is.	S.Is.	Total.
1954 ground lime	539,264	223,305	762569 tons
	189610	310.669	500279. tons

From 1898 to 1947 agricultural lime was railed free for the first 100 miles. This system became outmoded by the growth of road motor transport and bore unfairly on farmers dependent on long road hauls for their lime supplies. In addition, it had given rise to a considerable amount of wasteful overlapping of rail hauls. In 1947 the system was discontinued and the Lime Transport Assistance Scheme was introduced. The new scheme was revised in 1949 and has been amended slightly since. The present scale (December 1951) is as follows:—

Rail Transport—

First 15 miles, no subsidy.

Thereafter up to 115 miles, 75 per cent subsidy (with extensions beyond the 115-mile point to areas without closer sources of supply).

Water Transport—

Farmer pays full cost up to the equivalent of a 15-mile rail haul. Thereafter there is a 75 per cent subsidy.

Road Transport—

Direct from works to farm—

First 3 miles, no subsidy.

Next 17 miles, 4d. per ton per mile.

Thereafter, 6d. per ton per mile. Ceases at 30 miles if rail available.

Road after rail—

First 3 miles, no subsidy.

Next 7 miles, 4d. per ton per mile.

Thereafter, 6d. per ton per mile.

The cost of this subsidy, which amounted to about £364,000 for the year 1950–51, is shared as follows: Meat Pool Account, 70 per cent; Dairy Pool Account, 15 per cent; Consolidated Fund, 15 per cent.

To qualify for the subsidy, agricultural lime must now reach standards of calcium carbonate content and fineness of grinding.

All lime (with a tolerance of 5 per cent) must pass the eight-mesh British Standard sieve—that is, a sieve having eight holes to the linear inch; 50 per cent (with no tolerance) must pass the thirty-mesh British Standard sieve. (This standard has been maintained by most works in the past and is not considered to be unduly severe.)

The calcium carbonate standard is allowed to vary from district to district according to the lime available. The lowest district standard is 65 per cent and the highest 85 per cent. A lime which fails to reach the district standard but contains at least 50 per cent of carbonate receives the full road transport subsidy, but is subsidized on rail for only 50 miles instead of the usual 100 miles—from the 15-mile rail point to the 65-mile rail point. A lime containing less than 50 per cent of carbonate receives no rail subsidy, but the road subsidy is paid for a distance not exceeding 30 miles to be determined by the Director-General of Agriculture.

The new scheme sets out, first, to assist farmers to obtain as high a quality of lime as is reasonably available in each area; second, to ensure that the subsidy funds are applied mainly toward assisting the transport of the better-quality limes; and third, to enable the continuance in operation of works which produce lime of indifferent quality but which give valuable services in their localities.

Each district standard has been set at a level which enables about three-quarters of the lime produced recently to qualify, but the Department of Agriculture considers that most producers of substandard lime could make a better product by more careful selection of limestone for crushing.

REGULATIONS GOVERNING SALE AND DISTRIBUTION

The conditions under which the qualities of fertilizers offered for sale in New Zealand are specified are set out in the Fertilizers Act 1927, its amendments, and regulations. The Act makes provision for the annual

registration of all fertilizers offered for sale in quantities in excess of 5 cwt. at any one time. In registering a fertilizer the name of the fertilizer, the brand under which it is sold, the percentage of fertilizer ingredients, and its analysis have all to be stated, and all such details have to be written into the invoice certificate accompanying the consignment. The main objective of the Act is to protect the farmer against the possibility of fraudulent trade practices and to inform him of the composition of the material he purchases.

The following table sets out the area of grassland top-dressed:—

TABLE 45—GRASSLAND TOP-DRESSED

Year Ended 31 January.	Artificial Fertilizer Only. Acres.	Lime Only. Acres.	Fertilizer and Lime. Acres.	Total Area Top-dressed. Acres.
1929	2,531,530	223,373	2,966	2,757,869
1930	2,854,657	359,663	*	2,650,748
1931	2,432,438	438,878	*	2,871,316
1932	2,067,672	386,649	*	2,454,321
1933	1,741,035	102,952	594,127	2,438,114
1934	1,469,537	116,234	663,399	2,249,170
1935	1,703,325	145,986	834,803	2,684,114
1936	1,798,714	150,925	932,585	2,882,224
1937	2,122,386	176,763	1,027,130	3,326,279
1938	2,516,236	188,953	1,168,800	3,873,989
1939	2,584,618	218,445	1,213,881	4,016,944
1940	2,764,295	204,478	1,218,511	4,187,284
1941	2,923,378	250,972	1,474,967	4,649,317
1942	2,324,136	380,145	1,508,096	4,212,377
1943	1,574,786	570,847	1,324,422	3,470,055
1944	1,471,067	729,683	1,169,215	3,369,965
1945	1,602,887	726,467	1,317,037	3,646,391
1946	1,757,762	606,744	1,288,743	3,653,249
1947	2,237,300	566,018	1,456,676	4,259,994
1948	2,654,421	548,461	1,481,343	4,684,225
1949	2,981,899	584,427	1,496,086	5,062,412
1950	3,749,872	591,718	1,389,014	5,730,604

* Not quoted for these years.

TABLE 46—AREAS TOP-DRESSED AND QUANTITIES OF FERTILIZERS USED, 1950

Top-dressed with	Area. Acres.	Total Quantity Used. Cwt.
Artificial fertilizers only—		
Straight superphosphate	2,531,849	6,227,289
Basic, reverted, or serpentine superphosphate	609,542	1,773,191
Ground rock phosphate and/or basic slag	319,644	999,245
Other phosphatic fertilizers and mixtures	233,189	726,409
Manufactured organic fertilizers	55,648	161,047
Lime only	591,718	10,357,360
Artificial fertilizers and lime—	1,389,014	
Quantity of fertilizer		3,287,892
Quantity of lime		11,864,420

RURAL CREDIT AND LAND TENURE

SYSTEMS of farm credit operating in New Zealand are so closely bound up with the type of land tenure obtaining that some knowledge of the latter is essential to an understanding of the former. In general, the freehold tenure obtains throughout New Zealand. Sixty-six per cent of the land utilized for dairying is freehold, 11 per cent leasehold, and 22 per cent mixed freehold and leasehold. In contrast, only 30 per cent of the land used for sheep-farming is freehold, compared with 40 per cent leasehold and 30 per cent mixed freehold and leasehold. When these figures are analysed more closely, however, it is found that the bulk of this leasehold sheep country, which is on the foothills of the Southern Alps, is in extensive holdings, but of low carrying capacity, and mostly is held on Crown lease. The bulk of the land used for farming purposes other than sheep or dairy farming is held under freehold tenure.

This predominance of the freehold tenure has inevitably engendered problems of long-term credit to replace the long-term leasehold tenure, which is in itself almost the equivalent of an advance of long-term credit. It will not be possible here to describe in detail all the credit agencies in operation in New Zealand, but, briefly, the chief are:—

LONG-TERM CREDIT AGENCIES

(*a*) **Private Lenders:** Although accurate information of the actual amount of long-term mortgage debt is not available, there is little doubt that this form of credit still constitutes the bulk of mortgage indebtedness, but it is gradually decreasing in relative importance because of the increasing importance of the State Advances Corporation and the general decrease in mortgage indebtedness over the past ten or twelve years.

(*b*) **The State Advances Corporation:** This is the most important organization supplying long-term rural credit. The capital of the Corporation, £1,000,000, is held by the State, which appoints the Board of Directors. The Corporation is able to raise funds by the issue of State-guaranteed securities.

Usually advances are made up to two-thirds of the value of the land or other appropriate security. Loans are generally on a table mortgage with provision for repayment by regular annual instalments, and terms usually range from thirty to forty-five years. The rate of interest on loans has for some years remained at 4⅛ per cent. During the year ended 31 March 1951, 1,173 loans were made to farmers, involving £6,622,373.

(*c*) **The Public Trust Office:** The Public Trust Office, a State organization established in 1873, transacts a large volume of business as trustee, executive agent, or attorney. The loan policy of the organization is not dissimilar from that of the State Advances Corporation, the rate of interest at present ranging from 4 to 4½ per cent according to the amount lent.

(*d*) **The Life Insurance Companies:** Generally, life insurance companies prefer gilt-edged, marketable securities or easily handled, large investments to the less liquid and less reliable farm mortgages. Nevertheless, it is estimated that insurance companies have several million pounds out on rural mortgage on terms similar to those of the State Advances Corporation.

(*e*) **Banks:** There are five trustee savings banks in New Zealand, all of which lend money on rural security. Of the commercial banks only the Bank of New Zealand has special facilities devoted to farmers' long-term credit needs, but up to the present these have not been utilized to any extent. The terms on which long-term loans are made by banks are not dissimilar from those of other long-term lending institutions.

(*f*) **The Treasury:** Quite apart from land survey, land development, roading, drainage, irrigation, and subdivision carried out by the State, the Treasury has, in default of normal lending agencies, assisted farmers who suffered loss from floods, snow, earthquakes, or droughts by granting loan money on special terms.

INTERMEDIATE AND SHORT-TERM CREDIT

(*a*) **The Rural Intermediate Credit Board:** This is now in itself only of historic interest, as with the passage of the Rural Intermediate Credit Amendment Act in 1946 all the functions of the Board were taken over by the State Advances Corporation. Until 1946 the Board provided finance by making advances to co-operative rural intermediate credit associations, who readvanced to local farmers at 5 per cent. Loans were made principally for intermediate development work, and during the nineteen years it existed the Board advanced more than £1,920,000 by way of loans, discounts, and advances.

(*b*) **Stock and Station Agents:** With their intimate knowledge of the industry and of the standing of individual farmers with whom they deal, stock and station agents are in a position to extend loans with little formality. These loans may take the form of credit on the security of a bill of sale over live-stock or chattels, or they may be an advance of cash or goods, the debt being repayable from the proceeds of the sale of wool, lambs, or other stock. Interest rates are, of course, higher than for long-term loans (generally 5 to 6 per cent), and the conditions attaching to loans vary widely. Stock and station agents and merchants also provide farmers with working capital by arranging contract growing, a system applying to nearly all seed lines and to many others such as peas, malting barley, and tobacco.

(*c*) **Dairy Companies:** Almost all dairy companies are to-day co-operatively owned and for some time they have extended short-term credit to suppliers, particularly for the purchase of fertilizer and other dairy requirements. Some of the larger companies have subsidiary finance concerns which make advances on the security of live-stock and chattels—one company even makes first mortgage advances.

(*d*) **Commercial Banks:** The most important suppliers of intermediate credit and short-term credit are the commercial banks. They also provide credit for farmers indirectly, through the stock and station agents and the dairy companies. Advances are made mainly in the form of overdrafts, which, at present, provide a convenient and cheap form of working capital. The loan fluctuates and interest is paid only on the balance outstanding daily. There is a considerable saving by this method, as a fixed loan would have to be large enough to cover the point of heaviest indebtedness.

REHABILITATION OF EX-SERVICEMEN

The financing of ex-servicemen has raised special credit problems and the methods of dealing with these present some original features.

Land settlement is one of the major activities under New Zealand's rehabilitation scheme for ex-servicemen. The objective is to settle 12,000 ex-servicemen on the land, of whom 3,736 had still to be settled at 31 March 1951. The aim in every case is to settle ex-servicemen on farms which will be capable of producing sufficient to maintain the property, providing a reasonable standard of living for the ex-serviceman and his family, and paying all other outgoings, including mortgage charges.

Loan assistance is available up to the full value of land and improvements, stock, and chattels within the following limits: Sheep and mixed farms, £6,250; dairy-farms, £5,000; small areas with houses for ex-servicemen with permanent pensions who desire to supplement their income by carrying on some agricultural or other farming activities, £2,500. The interest rates are 2 per cent for the first year and 3 per cent thereafter. Loan assistance is made available on table mortgage, and in addition to interest payments there are annual repayments of principal. Loans are also considered for sums in excess of the normal loan limits, provided the ex-serviceman applicant can make some contribution toward the purchase. The contribution usually required is 50 per cent of the excess above normal loan limits.

MARKETING

OUTLINE OF ECONOMIC STABILIZATION

THE system of economic stabilization which has been in force since 1942 has been considerably relaxed since 1949–50.

In September 1939 all prices had been brought under control through the Price Tribunal, and in 1942 further steps were taken to stabilize prices. Wages were stabilized, an agreement was entered into with farmers' organizations for farm products stabilization accounts to be kept by the Marketing Department, and provision was made for consultation with various sections of the primary industries for any price adjustment to cover unavoidable cost increases, such as higher prices of imported machinery and raw materials. The general policy of stabilization was administered by a Stabilization Commission, appointed by the Government, which acted in an advisory capacity to the Minister in Charge of Stabilization. Price fixation was, and still is, done by the Price Investigation Tribunal. Stabilization operated in different ways, according to the commodity. In some cases price ceilings were established, in others maximum percentage mark-ups were applied, and for some staple commodities subsidies were paid to keep prices at pre-war levels. Prices paid to producers for most of the main farming commodities were stabilized at levels considerably below world parity and for the major exports at levels below those obtained under bulk-purchase contracts with the United Kingdom, the surpluses being paid into the stabilization reserve.

During 1949 and 1950 great changes were made in stabilization policy. The provisions penalizing payment of wages above award rates were repealed, prices of most vegetables, some fruits, and even of meat, fish, cheese, and some cereals such as maize and oats and a number of other goods and services were decontrolled, the Land Sales Act was amended, and the Stabilization Commission was dissolved. Prices of rural properties are still under supervision, except where sales are to children and grandchildren of the owners or to returned servicemen, as the Crown may buy the property at a fair price for a returned serviceman. Urban properties are free of control, which has led to an increase in the number of transactions and to higher prices. A Marketing Advisory Council, consisting of Government servants, responsible to the Minister of Marketing, has been appointed to take the place of the Stabilization Commission.

Prices paid to producers of meat now exceed the prices paid by the United Kingdom, and the full realizations of tallow, hides, and pelts are also paid out.

As high wool prices, due to stock-piling, caused concern about the stability of the economy, a Wool Proceeds Retention Act was passed in November 1950. It provides for the freezing of a third of the proceeds received by woolgrowers from the sale of wool, but a farmer may receive £500 before the provisions come into operation and may withdraw 20 per cent of the amount frozen each year from 1952.

In May 1950 subsidies were removed in some cases and reduced in others, compensatory wage increases being granted to cover the resulting increase in the cost of living. Later in the year, because of increasing international tension and the consequent general rise in prices, a further substantial wage increase became necessary. From 15 February 1951 all wages and salaries were increased by 15 per cent and subsidies were reintroduced on several items. These included a subsidy of 50 per cent on woollen yarns used in local mills. To limit the spiralling effect of increased production costs on prices the Price Tribunal is limiting the increased wage cost that may be passed on by manufacturers to 75 per cent of the total increase.

REGULATION OF LAND SALES

The Servicemen's Settlement and Land Sales Act 1943 had two objects:—

Acquisition of land for discharged servicemen settlement.
Stabilization of land values at those ruling in December 1942.

Power was given to the Crown to acquire land compulsorily if in the opinion of the Land Sales Court the land was suitable for the settlement of discharged servicemen and the owner had sufficient other land for the reasonable purposes of himself and his dependants. The Crown was also given power to intervene on private sales of farming land and take the land being sold if the Land Valuation Court considered the land suitable for the settlement of discharged servicemen. In either case the price to be paid for the land was fixed by the Land Valuation Court on values ruling in December 1942.

The Servicemen's Settlement Act 1950 made several very important changes with regard to farm lands. By that Act the Servicemen's Settlement and Land Sales Act was revoked, though many of the provisions of the former Act are included in the new Act.

The Crown is still empowered to take over land compulsorily for settlement of discharged servicemen and to buy any land coming up for sale before the Land Valuation Court, if the Minister of Lands thinks it suitable for soldier settlement. It is in regard to the price of the property that the change has been made. If the land is taken over compulsorily, the Land Valuation Court will fix the reasonable market value for compensation. In other cases the Land Valuation Court is not concerned with the price of land, even if the sale is to an ex-serviceman.

However, if the returned serviceman has been granted a rehabilitation loan, he may still acquire his farm at the 1942 price through the provisions of the Land Amendment Act 1950. Under this Act the returned serviceman may apply for an interest-free mortgage for the difference between the present and the 1942 price, this mortgage being discharged if after ten years he still farms the land and resides on it.

It appears that though the Government will no longer interfere with the rapid rise in the price of land, ex-servicemen will be protected at least against a recurrence of the happenings of the 1920's, when many ex-servicemen from the First World War encountered difficulties from high land prices.

The following is a summary of acquisitions of farm land for the settlement of ex-servicemen since the inception of the settlement scheme to 31 March 1951:—

	Area. Acres.	Estimated Number of Units.
Purchased by voluntary negotiation	868,941	1,576
Acquired compulsorily under Part II, Servicemen's Settlement and Land Sales Act 1943	118,788	390
Acquired compulsorily under section 51, Servicemen's Settlement and Land Sales Act	143,368	466
Properties where ex-servicemen substituted under section 31D of Servicemen's Settlement Act 1950	1,456	5
	1,132,553	2,437

MARKETING OF FARM PRODUCTS

The marketing of farm products, using the term in the broad sense to include various attempts at price regulation and stabilization, has been a problem which cannot be understood without some background knowledge of the development of New Zealand generally and its agriculture in particular. New Zealand farmers have deliberately concentrated on a relatively narrow range of pastoral products for the export market. The term "export surplus" sometimes used in referring to meat, wool, and

dairy-produce exported from New Zealand is both erroneous and misleading, except in reference to a few of the minor items of exports, such as small seeds or hides.

Approximately 80 per cent of butter, 95 per cent of cheese, 65 per cent of meat, and 96 per cent of wool produced are exported, and these items constitute 84 per cent of total exports, which in 1950 amounted to £95 per head of the mean population. These exports provide funds which pay for imports of manufactured goods, raw materials, and products unobtainable locally and thus give New Zealanders a relatively high standard of living. Consequently, prices received for primary produce on often widely fluctuating world markets are of vital interest not only to the farmers, but to Governments and the people generally, with the inevitable result that political considerations have played a large part in what should be directly economic and technical problems.

The marketing problems connected with goods produced for export are essentially different from those relating to products produced solely or principally for local consumption. With some of the latter products, marketing problems are out of proportion to the apparent importance of the products.

MARKETING OF EXPORT PRODUCE

DAIRY-PRODUCE

The development of sheep and arable farming was characterized by large holdings and prosperous conditions and by opposition to anything savouring of planned marketing, even by the producers. The attitude of farmers has been largely supported by economic facts, in that New Zealand produce is dependent on world markets, in which, in certain lines, it has an important but by no means a dominant position. On the other hand, there has always been a strong tradition of economic security and opposition to exploitation of the poorer members of society in the political thinking of New Zealanders.

The organization of the dairy industry is different from that of the sheep industry. The dairy industry developed much later and is characteristically carried on on relatively small holdings, frequently by people whose economic status necessitates their obtaining a maximum return for their produce. It is in the dairy industry that co-operation has reached its highest level.

Although the economic depression of 1921 saw the formation of both the New Zealand Meat Producers Board (see page 138) and the New Zealand Dairy Board (see page 136), only the Dairy Board ventured into marketing overseas. This was in 1926, but conditions on the London market at the time were such that the Board virtually was attempting monopoly action without being in a monopoly position.

During the depression of the 1930's, although price falls were relatively much greater in meat and wool than in dairy-produce, the position of dairy-farmers was precarious, because of their small margin of profit and their inability to obtain short-term credit. Attempts to reduce costs by compulsory wage, rent, and interest reductions, and at the same time to raise prices by depreciating the exchange rate, proved only partially effective.

In 1943 a special Commission, known as the Dairy Industry Commission was set up. In its findings the Commission stated: " . . . the opening of new markets for the disposal of surplus production can best be undertaken by a single central body acting in the national interest and having due regard to all branches of production."

The necessary authority for puting into operation the main recommendations of the Commission was given by a special Act which set up an Executive Commission of Agriculture. Among other measures, the Executive Commission reconstituted the Dairy Board and gave it power to control local marketing of butter and cheese. Before much action had been taken, however, the 1935 elections saw the advent to power of the Labour Government, which, among its first measures, introduced the scheme

of guaranteed prices for butter and cheese. The scheme involved setting up a marketing organization, which was accompanied by the passing, in 1936, of the Primary Products Marketing Act, which gave the Government power to set up a Primary Products Marketing Department to purchase all primary products intended for export or local consumption.

From 1936 to 1939 the Marketing Department conducted the marketing of butter and cheese in the United Kingdom, working through a panel of brokers. An extensive publicity, advertising, and sales campaign was conducted—a campaign, incidentallly, continued in modified form over the war years and since, with the eventual return to competitive conditions in mind.

The deterioration in the European situation during 1938 and 1939 had led to the formulation of plans in the United Kingdom and New Zealand for the supply of foodstuffs and other produce in the event of war. These plans, which were put into effect shortly after the outbreak of war, envisaged the United Kingdom Government becoming the sole purchaser of imported foodstuffs and the Marketing Department becoming the authority in New Zealand responsible for the bulk purchase and shipment of the various food and other products. The first contract for dairy-produce began with the produce of the 1939–40 season, and fixed quantities were agreed upon. The system of annual agreements for specified quantities continued to the end of the 1943–44 season. For 1939–40 and 1940–41 the United Kingdom Government required a larger quantity of butter than cheese, but in 1941–42 the position was reversed. Owing to the increase in supplies of cheese from North America, however, the United Kingdom Government requested that in 1942–43 butter exports should again exceed cheese exports.

As the war progressed and essential imports were procurable only in limited quantities it became apparent that to visible cost increases had to be added the cumulative cost of deferred maintenance and loss of soil fertility due to shortages of men, materials, and requisites necessary for efficient farming. To compensate for this the United Kingdom Government increased the prices of New Zealand's exports, at the same time granting lump-sum payments to cover losses in previous years. These were in recognition of the benefits desired by the United Kingdom from a supply of foodstuffs at prices made relatively cheap through New Zealand's stabilization policy of putting a severe brake on cost increases.

The first long-term contract for the purchase of butter and cheese was entered into early in 1944. The period of the contract at first was for the four production years 1944–45 to 1947–48, but it was extended in 1946 to 1948–49 and 1949–50. Negotiations in June and July 1948 between the United Kingdom Ministry of Food and the delegation representing the Dairy Products Marketing Commission resulted in a new long-term agreement (incorporating the unexpired term of the then current contracts) for the period throughout 1948 and up to 31 July 1955. The salient features of the agreement for the seven-year period are:—

(1) All purchases are to be f.o.b. New Zealand ports and the United Kingdom Government is responsible for providing shipping.

(2) Payment is to be made in sterling in London—97½ per cent on shipment and 2½ per cent within sixty days after the date of the last bill of lading. If the lifting of available supplies is delayed unduly, the United Kingdom Government is to make interim payments.

(3) Prices, terms, and conditions of sale set out in the agreement are to apply throughout the period, unless before 1 May in each year either party requires reconsideration for the ensuing season. Price variations in any one season are not to exceed 7½ per cent of the previous season's price.

(4) The United Kingdom Government and the New Zealand Dairy Products Marketing Commission are to consult and agree upon the ratio of butter production to cheese production for the season and the quantities of butter and cheese which will be reserved for sale to other countries during the production season.

Since 1945–46 there have been annual increases in price for butter and cheese, as shown in Table 47. As costs of production have continued to rise, a further 7½ per cent was granted for the 1951–52 season and other concessions made. In addition, full payment is now made in sterling in London on shipment instead of 97½ per cent as formerly.

At first 97½ per cent of butter and cheese exported (calculated on a butterfat basis) had to be sold to the United Kingdom, but for 1950–51 New Zealand was permitted to sell 10 per cent of her exports surplus to other markets. This proportion has been increased to 15 per cent for the 1951–52 season. The prices that can be obtained on markets other than the United Kingdom market are considerably higher than those paid under the bulk-purchase agreement. During the season 1950–51 sales of butter and cheese to countries outside the United Kingdom realized £1,520,000 above the guaranteed price paid out internally and brought £1,320,000 more than if the produce had been sold to Britain.

In response to an appeal from Britain for more food, New Zealand has decided to restrict her drive for other markets and to send more cheese and butter to the United Kingdom. It is estimated that in the 1951–52 season only 10 per cent of the export butter and 5 per cent of the export cheese will be sent to markets other than Britain.

Quantities of dairy-produce such as milk powders and evaporated milk to be sold under the bulk-purchase agreements are fixed annually, each factory undertaking to supply a certain amount.

Until May 1947 the Export Division of the Marketing Department was responsible for the export of dairy-produce, but now the New Zealand Dairy Products Marketing Commission is the agent of the Government for the purchase and sale of butter and cheese intended for export and the regulation and control of the distribution of butter and cheese for the local market. The Commission consists of seven members; three are Government nominees, three are representatives of the industry, and the Chairman is appointed on the nomination of the Minister of Marketing after consultation with the New Zealand Dairy Board. The ownership of all butter and cheese intended for export passes to the Commission on the 20th day of the month after the month in which the butter or cheese is graded. After grading at the ports by Government graders, produce is stored for shipment, shipping space being allotted by the Overseas Shipowners' Allotment Committee. Dairy factories are paid the guaranteed price, which is not necessarily in line with the price received under the bulk-purchase contracts, but is based on estimated cost of production.

Manufacturers of dairy-produce such as casein, buttermilk powder, roller skimmed-milk powder, and whole-milk powder are required to sell a big proportion of the materials they have for export to the Commission. The prices for these products are not guaranteed on the same basis as the prices for butter and cheese, the full proceeds realized overseas less ½ per cent marketing charge being paid to supplying dairy companies.

Table 47 on pages 120–121 shows prices paid by the United Kingdom Ministry of Food under bulk-purchase contracts to various countries and Table 48 on page 122 the destinations of New Zealand exports of butter and cheese during the past ten years.

GUARANTEED PRICES

To give some measure of stability to the dairy industry a system of guaranteed prices was inaugurated in 1936. Section 20 of the Primary Products Marketing Act 1936 sets out the principles which underlie the fixing of the guaranteed price:—

(*a*) With respect to dairy-produce exported on or before 31 July 1937, after taking into consideration prices received during a period of from eight to ten years immediately before 31 July 1935.

(Continued on page 123.)

TABLE 47—PRICES OF BUTTER AND CHEESE UNDER UNITED KINGDOM MINISTRY OF FOOD CONTRACTS

(In sterling per hundredweight f.o.b.)

	Butter.								
	New Zealand (Finest Grade).			Australia.			Denmark.		
	s.	d.		s.	d.		s.	d.	
1939–40	112	6		109	9				
1940–41	112	6		109	9		Sept.–Oct. 1939	125	0
							Nov. 1939–Feb. 1940	130	8
1941–42	112	6	limited to 115,000 tons	109	9		Mar. 1940	117	0
1942–43	117	0	increased to 120,000 tons	114	3				
1943–44	143	1½	+ lump-sum payment for 4 years	114	3	+ repayment export subsidies			
1944–45	150	6		147	9	+ lump-sum payment of 13s. 4d. per cwt.	1945	266	0
								238	0
1945–46	150	6		147	9	+ lump-sum payment of 13s. 4d. per cwt.	1946	230	0
								205	0 for not less than 43,000 tons.
								220	0 + 90% of quantity in excess of 77,000 tons.
1946–47	175	0		173	6		Jan.–Sept. 1947	242	0 62½% exportable surplus up to 73,000 tons + 90% of quantity exported in excess.
1947–48	205	0		203	6		Jan.–Sept. 1948	321	6 for 45,000 tons.
1948–49	235	0	for not less than 97% of the exportable surplus	233	6		Oct. 1948–Sept. 1949	321	6 for 69% of the exportable surplus.
1949–50	252	6	for not less than 97% of the exportable surplus	251	0		Oct. 1949–Sept. 1950	271	6 for 75% of the exportable surplus with maximum of 115,000 tons.
1950–51	271	6	for not less than 90% of the exportable surplus	271	6				
1951–52	292	6	for not less than 85% of the exportable surplus						

	Cheese.								
	New Zealand (First Grade).			Australia.			Canada.		
	s.	d.		s.	d.		s.	d.	
1939–40	64	3		61	3				
1940–41	64	3		61	3		70	9	
1941–42	70	0	increased to 160,000 tons	67	0		72	10	
1942–43	73	0	reduced to 90,000 tons	70	0		101	1	($4·42 to pound).
1943–44	85	6½	+ lump-sum payment for 4 years	70	0	+ repayment of export subsidies	105	6	($4·42 to pound at factory point).
1944–45	89	0		86	0	+ lump-sum payment of 8s. 9d. per cwt.	105	6	($4·42 to pound at factory point).
1945–46	89	0		86	0	+ lump-sum payment of 8s. 9d. per cwt.	105	6	($4·42 to pound at factory point).
1946–47	102	6		101	0		105	6	($4·42 to pound at factory point).
1947–48	118	0		116	6		144	0	($4·03 to pound at factory point).
1948–49	133	0	for not less than 97% of the exportable surplus	131	6		172	0	($4·03 to pound at factory point).
1949–50	141	6	for not less than 97% of the exportable surplus	140	0		181	9·82	(calendar year $3·08 to pound at Canadian seaboard).
1950–51	151	0	for not less than 90% of the exportable surplus	151	0				
1951–52	161	6	for not less than 85% of the exportable surplus						

TABLE 48—DESTINATIONS OF BUTTER AND CHEESE EXPORTS

(Thousand tons)

—	United Kingdom.		Canada.		U.S.A.		Carribean.		Middle East.		Other.		Total Shipments.	
	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.	Butter.	Cheese.
1939–40 ..	128·2	92·4	..	0·1	*	..	0·8	..	0·3	*	1·1	*	130·4	92·5
1940–41 ..	133·8	117·7	0·1	0·1	..	..	1·3	..	0·2	*	0·8	*	136·2	117·8
1941–42 ..	101·2	147·6	0·1	0·1	*	2·4	0·8	..	0·1	*	1·3	*	103·5	150·1
1942–43 ..	103·8	93·4	..	..	4·8†	1·5†	..	..	..	2·2‡	0·2	0·2	108·8	97·3
1943–44 ..	101·1	81·5	..	..	9·1†	3·0†	..	..	..	0·8‡	0·4	0·1	110·6	85·4
1944–45 ..	122·3	90·1	..	..	8·7†	4·5†	..	..	..	1·6‡	0·3	0·3	131·3	96·5
1945–46 ..	105·2	87·2	..	..	0·7†	0·2†	..	..	*	*	0·3	0·1	106·2	87·5
1946–47 ..	117·3	82·8	2·3	..	4·3	..	0·2	0·1	0·5	0·3	0·6	0·3	125·2	83·5
1947–48 ..	127·7	79·5	*	..	..	..	0·9	*	0·4	0·2	0·6	0·5	129·6	80·2
1948–49 ..	139·0	89·0	1·1	..	..	..	1·3	0·2	1·1	0·2	1·6	2·3	144·1	91·7
1949–50 ..	138·3	89·0	..	0·4	..	6·0	1·6	0·3	1·3	0·8	3·1§	1·3‖	144·3	97·8
1950–51 ..	136·8	90·5	2·2	5·4	..	3·9	1·4	0·5	2·0	0·1	7·6¶	1·5	150·0	101·9

* Quantity less than 50 tons. † Quantity supplied to United States forces in Pacific. ‡ Quantity supplied to Allied forces in Middle East
§ Including France, 2,000 tons, and Italy, 600 tons. ‖ Including European countries, 1,069 tons. ¶ Including France, 3,000 tons, Germany, 2,330 tons, and Italy, 650 tons.

(*b*) With respect to dairy-produce exported after 31 July 1937, having regard to prices fixed under (*a*) above, and to the following additional considerations:—

(i) The necessity in the public interest of maintaining the stability and efficiency of the dairy industry.

(ii) The costs involved in the efficient production of dairy produce.

(iii) The general standard of living of persons engaged in the dairy industry in comparison with the general standard of living throughout New Zealand.

(iv) The estimated cost to the Department of marketing the dairy-produce concerned, and also the cost of the general administration of the Act.

(v) Any other matters deemed to be relevant.

(*c*) Due regard having been paid to matters set out in (*b*) the prices fixed in respect of any dairy-produce exported after 31 July 1937 were to be such that any efficient dairy producer under usual conditions and in normal circumstances should be assured of a sufficient net return from his business to enable him to maintain himself and his family in a reasonable state of comfort.

Guaranteed prices for butter and cheese commenced as from 1 August 1936. The prices fixed were for purchase by the Marketing Department (Export Division) on a f.o.b. basis, New Zealand currency, and differentiated according to quality, the three basic grades being:—

Creamery butter	.....	Finest grade, 93 to 93½ points
Whey butter	.....	First grade
Cheese	....	First grade 92 to 92½ points

All basic prices for the three products concerned which are quoted subsequently apply specifically to these particular grades.

Guaranteed Prices Committees, representative of producers and of the Government, were set up in 1936, 1937, and 1938 to recommend to the Government the prices to be fixed. From 1943 onward various cost allowances have been granted following producer representation to the Economic Stabilization Commission. (After the formation of the Dairy Products Marketing Commission the power to fix the guaranteed price was transferred to the Commission.) The prices recommended by the various committees were based on standards of efficiency and standard allowances which have become accepted by the industry and the Government as the basis for deciding variation in fixed or guaranteed prices. The standards of efficiency are based on:—

(*a*) Butterfat* per acre—100 lb. to 175 lb.

(*b*) Butterfat* per cow—220 lb. to 260 lb.

(*c*) Butterfat* per adult male unit (or equivalent)—6,000 lb.
(Two adult males for 48 cows at an average of 250 lb. of butterfat per cow, or for 50 cows at an average of 240 lb. of butterfat per cow.)

Other standards adopted are:—

(*d*) A dairy-farm is efficiently capitalized at an average of £75 per cow.

(*e*) A reasonable all-over allowance for interest as given in (*d*) —4½ per cent per annum.

(*f*) Standard gross returns from pigs on cream producing farms —1·54d. per pound of butterfat.

(*g*) Standard allowance to represent value of housing and other perquisites enjoyed by a dairy-farmer and his family—£1 10s. per week.

* Being that portion delivered to the factory.

Table 49 sets out the changes in guaranteed price since 1938–39. The Dairy Products Marketing Commission decides what to pay for butter and cheese—not butterfat—and from that point calculations are made by

(Continued on page 126.)

TABLE 49—GUARANTEED PRICE STRUCTURE, 1938–51: BASIC FARM-COST STRUCTURE, WITH ACTUAL PAYOUTS SHOWN FOR COMPARISON

(Pence per pound butterfat)

——	1938–39*.	1942–43.	1943–44.	1944–45.	1945–46.	1946–47†.	1947–48.	1948–49‡.	1949–50§.	1950–51‖.	1951–52.
Farm working and maintenance costs	5·340	5·510¶	6·107	6·757	7·254	8·015	10·011	10·179	10·199	10·905	12·342
Capital charges	3·240	3·240	3·240	3·240	3·240	3·240	3·240	3·240	3·240	3·240	3·240
Labour reward	8·840	9·280	9·450	10·920	11·440	13·676	14·196	14·872	16·345	17·073	19·613
Total	17·420	18·030	18·797	20·917	21·934	24·931	27·447	28·291·	29·784	31·218	35·195
Less return for pigs	1·540	1·540	1·540	1·540	1·540	1·540	1·540	1·540	1·540	1·540	1·540
Basic price for butterfat for butter ..	15·880	16·490	17·257	19·377	20·394	23·391	25·907	26·751	28·244	29·678	33·655
Average factory payouts for butterfat for butter**	16·087	16·569	17·597	19·790	20·568	23·691	26·218	27·368	28·720	..	..
Basic price for butterfat for cheese ..	17·880	18·490	19·257	21·377	22·394	25·391	27·907	28·751	30·244	31·678	36·155
Average factory payouts for butterfat for cheese**	18·060	18·577	19·655	22·055	22·884	25·753	27·943	29·192	30·785	..	..
Total Payments to Factories‡‡											
Butter—											
Basic price for butterfat for butter	15·880	16·490	17·257	19·377	20·394	23·391	25·907	26·751	28·244	29·678	33·655
Allowance for costs of manufacture	2·250	2·250	2·542	2·614	2·661	2·711	3·133	3·197	3·252	3·388	3·852
Total payments per pound for butterfat for butter	18·130	18·740	19·799	21·991	23·055	26·102	29·040	29·948	31·496	33·066	37·507
Total payment per pound for butter basic grade converted at overrun of 21·75 per cent	14·890	15·390	16·259	18·060	18·934	21·437	23·852	24·598	25·8694	27·1589	30·8066

Cheese—											
Basic price for butterfat for cheese	17·880	18·490	19·257	21·377	22·394	25·391	27·907	28·751	30·244	31·678	36·155
Allowances for costs of manufacture	3·500	3·650	4·025	4·375	4·395	4·595	5·430	5·723	6·115	6·490	7·209
	21·380	22·140	23·282	25·752	26·789	29·986	33·337	34·474	36·359	38·168	43·364
Less allowance for whey butter per pound butterfat	0·750	0·750	0·750	0·750	0·750	0·750	1·335	1·335	1·457	1·535	1·714
Total payment per pound for butterfat for cheese	20·630	21·390	22·532	25·002	26·039	29·236	32·002	33·139	34·902	36·633	41·650
Total payment per pound for cheese (basic grade converted at yield 2·45)	8·420	8·730	9·196	10·204	10·628	11·932	13·062	13·526	14·2457	14·9522	17·000

* There was no change in the guaranteed price structure from 1938–39 to 1941–42.

† A retrospective payment of 1·716d. per pound butterfat was included with the labour reward, but was paid only to factories from 1 November 1946 to 31 July 1947. The estimated additional payment over the complete season is 1·226d. per pound butterfat, making the basic prices for butterfat for butter and cheese equal to 22·901d. per pound and 24·901d. per pound respectively, and the basic prices for the products 21·034d. per pound (butter) and 11·732d. per pound (cheese).

‡ Structure for the period 1 August 1948 to 31 May 1949 only. For June and July 1949 an additional labour reward allowance of 1·395d. per pound butterfat was paid; butter and cheese prices for this period were 25·7437d. per pound and 14·0486d. per pound respectively.

§ Structure for the period 1 August 1949 to 30 April 1950 only. For May to July 1950 inclusive an additional labour reward allowance of 0·728d. per pound butterfat was paid; butter and cheese prices for this period were 26·4674d. per pound and 14·5265d. per pound respectively.

‖ As from 15 February the labour award has been increased by 1·729d.

¶ 1942–43 increase of 0·17d. per pound butterfat was transferred from farm working and maintenance costs to labour award at the beginning of the 1943–44 season.

** Including farm costs allowances from 1943–44 to 1946–47 seasons inclusive. Average factory payouts up to 1946–47 season are from Marketing Department reports. Payouts for the seasons 1939–40 to 1941–42 were:—

	1939–40.	1940–41.	1941–42.
Butter	16·179	16·106	16·017
Cheese	18·091	18·043	18·025

‡‡ Including, for the seasons 1943–44 to 1946–47, farm and factory costs allowances. Conversion of allowances to a products basis has been made at the standard overrun and yield ratios.

dairy factories to determine the payout to producers. As can be seen from Table 49, the estimated payout, calculated by the Dairy Products Marketing Commission, has in the past been below the actual average payout. The actual payout varies from factory to factory and depends on the efficiency of the factory, its location, and its size.

MEAT

Before the discovery of the refrigeration process New Zealand-grown meat was consumed within the country, except for some salt meat exported as ships' stores. The development of the frozen meat export trade stimulated a change in the type of sheep and cattle carried on farms. Previously, sheep were kept chiefly for their wool-producing qualities, and such carcasses as could not be consumed locally were rendered down for tallow. When meat became valuable the dual-purpose sheep became more prominent, especially on the lower and more fertile country. The growth of an export trade in frozen meat brought about also the development of a large processing industry for meat products. Meat freezing and preserving works are the largest of industrial works in New Zealand, from the point of view of capital invested, added value of output, salaries and wages paid, and capital value per unit.

Before the Second World War there were several methods of exporting meat. The meat could be killed on the farmer's own account and shipped on consignment to an English selling broker for sale on behalf of the farmer. Overseas buyers also operated and usually had direct connection with English chain stores and large retail houses and shipped direct to them. In other cases freezing-works killed on their own account or stock and station agents exported the meat, usually either c.i.f., ex-ship, or in store, London. In most cases, however, the meat was consigned to an English house or English representative, who acted on behalf of the New Zealand exporters.

Difficult Period

The early 1920's were as difficult a time for the meat industry as they were for the dairy industry. During the 1914–18 war and for a period after it all exportable meat had been requisitioned and sold under contract to the United Kingdom Government. This contract terminated on 30 June 1920. At that date over 180,000 tons of meat (the equivalent then of at least one season's production of meat for export) were in store in New Zealand. As a result, the United Kingdom market was called upon to absorb during the ensuing season nearly two seasons' production of meat from the Dominion. This large influx of meat depressed prices at a time when costs, if anything, were tending to rise. The producer was thus faced with rising costs and falling prices and with little prospect of relief. This position led to the formation in 1922 of the New Zealand Meat Producers Board to take control of the meat industry. The Board was given wide powers by the Meat Export Control Act 1921–22, but has used these powers sparingly and with moderation. The work of the Board is fully outlined in the chapter on producer organizations.

The Board's path was not smooth. Difficulties arose as a result of the Ottawa Conference and the Second World War. In 1932 the British meat market was clogged with supplies, which reduced the price of all meats, local and imported, and a serious position faced the Home producer. As a result of the Ottawa Conference, severe quota restrictions were placed on imports of foreign mutton, lamb, and frozen beef to the United Kingdom, and imports of chilled beef were restricted to the volume of the previous twelve months. No restriction was placed on the importation of frozen meat from New Zealand during the period ended 30 June 1934, except to the extent that the Dominion was required to give an estimate of shipments of mutton and lamb for each export season up to 30 June 1934 and to keep within that estimate. As from 1 July 1934, short-term quotas were imposed on the importation of New Zealand meat into the United

Kingdom. These short-term quotas were unsatisfactory, as they created considerable difficulty in allotting shipping. Consequently, an agreement was reached for long-term quotas covering the period to 31 December 1938. Up to that date the restrictions did not prove serious enough to cause any considerable glut of meat on the local market, and the Dominion came through the four and a half years of restrictions satisfactorily. However, in 1939 Home market prices deteriorated, and the United Kingdom Government decided that the quota for mutton and lamb for that year should be 3 per cent below the level of the preceding year's imports. The New Zealand Meat Producers Board opposed this restriction, on the grounds that it would cause undue hardship to the Dominion, as the 1938 season, on which the quota was based, had been a poor production year, due to drought, and 1939 killings gave every indication of reaching record levels. It appeared that there was every prospect of unprecedented stocks of meat surplus to local requirements being held in store with little hope of finding a profitable market. The immediate future of the meat industry looked far from bright, and a situation that may have called for drastic restrictive measures was averted only by the outbreak of war in 1939.

Wartime Agreements

On the declaration of war, normal arrangements for the buying and shipment of export meat were superseded by a purchase agreement with the United Kingdom Ministry of Food. The Marketing Department became the authority in New Zealand responsible for bulk purchases and the shipment of food and other products. Until April 1943 severe restrictions had to be placed on the killing of meat for export because of the shipping position, but after that Britain agreed to buy the total exportable surplus of meat. Disposal of the exportable surplus was also assisted by the activity of the United States Joint Purchasing Board. A new era had been reached. Where previously everything possible had to be done to keep production within bounds, it now became necessary to attempt by every means to increase the export tonnage.

Bulk-purchase Contracts

The first long-term bulk-purchase contract for meat between the New Zealand Government and the United Kingdom Ministry of Food was entered into in 1943, and extensions were granted in 1946 and 1948. The contract provisions for beef, veal, mutton, lamb, and frozen sundries and edible offal are similar to those for butter and cheese. For pig-meats the arrangement is that during the first four years of the agreement the quantity of pig-meat covered by the contract is to be the total available supply and for the remaining three years the United Kingdom is to negotiate in advance for the quantities required. In addition, the United Kingdom is bound to resume progressively the importation of chilled beef when circumstances permit.

When the Marketing Department was reorganized in 1948 the New Zealand Meat Producers Board was appointed to act as agent for the New Zealand Government in the export of meat.

After the meat has been inspected and graded it is held in store at the export works until advice has been received that shipping space has been allocated through the Overseas Shipowners' Allotment Committee, and it is the responsibility of the freezing and exporting companies to ensure that the meat is delivered to vessels in good condition. As a war measure, to conserve shipping, mutton and lamb carcasses were telescoped, but this treatment detracted from the market appearance of the meat and was abolished on 1 October 1950.

In past years fat-stock prices to be paid to farmers by the meat-export companies were fixed by the New Zealand Meat Producers Board in consultation with the Government and export companies. Owing to the decontrol of the prices of pelts and hides, however, this is no longer possible, and consequently payouts to farmers by meat exporters are now left to competition. As the price to be paid for the bare meat is still

TABLE 50— PRICES FOR MEAT UNDER BULK-PURCHASE CONTRACTS

(Pence (sterling) per pound)

Item.	1939–40; 1940–41.	1941–42.	1942–43; 1943–44.	1944–45; 1945–46.	1946–47; 1947–48.	1948–49.	1949–50.	1950–51.
Lambs—								
Downs (23–36 lb.)	6·375	6·75	6·75	8·5	9·1375	10·8375	11·6503	12·4003
Canterbury (23–36 lb.)	6·3125	6·6875	6·6875	8·4166	9·0478	10·7312	11·5361	12·2861
Crossbred (23–36 lb.)	6·1875	6·5625	6·5625	8·25	8·8687	10·5187	11·3076	12·0577
Seconds (23–36 lb.)	5·875	6·25	6·25	7·8333	8·4208	9·9875	10·7366	10·7366
Wethers—								
Prime (48 lb. and under)	4·3125	4·5625	4·5625	5·75	6·1812	7·3312	7·8811	7·8811
Seconds (56 lb. and under)	3·6875	3·9375	3·9375	4·9166	5·2853	6·2687	6·7389	6·7389
Ewes (64 lb. and under)	2·75	3·0	3·0	3·6666	3·9416	4·675	5·0256	5·0256
Quarter beef—								
Ox and heifer GAQ—								
Hinds	4·375	4·75	4·9375	5·8333	6·2708	7·4375	7·9953	12·5349
Fores	2·5625	2·9375	3·125	3·4166	3·6728	4·3562	4·6829	7·3420
Cows GAQ—								
Hinds	3·25	3·625	3·8125	4·3333	4·6583	5·525	5·9394	5·9394
Fores	2·4375	2·8125	3·0	3·25	3·4937	4·1437	4·4545	4·4545
Pigs—								
Porkers—full carcasses (first quality) ..	6·0	6·25	7·5	8·0	8·9	10·56	11·352	14·4702
Sides (first quality)	6·3125	6·5635	7·875	8·4167	9·3635	11·11	11·9432	14·9432
Baconers—full carcasses (first quality) ..	6·0625	6·4375	7·725	8·0834	8·9927	10·67	11·4702	14·5885
Sides (first quality)	6·8125	7·1875	8·625	9·0834	10·1052	11·99	12·8892	15·8892

fixed, it is the different expectations as to prices for wool, hides, and pelts that enable meat-export companies to offer competitive prices. It is the duty of the New Zealand Meat Producers Board to ensure that the producers receive an adequate return. Meat-export companies receive payment from the Board for the bare meat, on the basis of their fortnightly killing returns, thirteen weeks after the date of killing, irrespective of when the meat is shipped. The price paid to the companies is f.o.b., the works being responsible for all charges incurred until time of shipment. Farmers who are not satisfied with fat-stock prices offered by meat-export companies may send stock through to export on their own account, provided the quantity is sufficiently large. The only difference in such a case is that the producer has the responsibility for marketing the wool, pelts, and hides, the meat still being sold to the New Zealand Meat Producers Board at the fixed price.

The price paid to the export companies is not related to the price received from the United Kingdom, but is based on the schedule prices paid to farmers by the exporters. As a result, during 1950–51 payments to the meat exporters for quarter beef and porkers have exceeded receipts from the United Kingdom under the bulk-purchase contract.

While the meat shortage continues in the United Kingdom only very small quantities are being shipped elsewhere, but the possibility of exploring other markets, especially the North American market, is receiving consideration.

TALLOW

The 1950–51 tallow contract with the United Kingdom Ministry of Food provided for the release of unrestricted quantities of edible mutton tallow and restricted quantities of inedible tallow for sale to other markets. Prices are arranged annually and fluctuate considerably. In the past they were substantially above the prices paid to the manufacturers, the surplus received being paid into the Meat Industry Account, but since October 1950 the total amount received from the Ministry of Food has been paid to the manufacturers.

Table 50 shows the prices received for various types of meat under bulk-purchase contracts.

WOOL

A full decription of the methods of disposal of wool is given in the section on wool production (pages 77–78).

LOCAL MARKETING

So far, discussion has centred round those products sold overseas. Agricultural products sold on the local markets are very numerous, and as the systems of marketing vary considerably according to the nature of the product, the question can be reviewed only in general terms.

BUTTER

The distribution of butter has been controlled since 1937, when the Internal Marketing Division bought out a large company dealing wholesale in primary products. Since May 1948 the Dairy Produce Marketing Commission has been responsible for the handling of all dairy-produce for export and for the marketing of butter and cheese in New Zealand. In carrying out its duties the Commission must ensure that sufficient butter is kept in store to satisfy local demand and to prevent local shortages. The Commission licenses merchants, farm products co-operatives, and dairy companies to act as wholesale distributors for butter, the relative importance of the groups being as follows (1949–50 figures):—

Dairy companies sell most of the butter sold in the northern half of the North Island, some in Taranaki, and that sold in Canterbury, Otago, and Southland. Sales were 35,000,000 lb.

Farm products co-operatives are groups of dairy companies in various districts licensed to distribute their own butter through their own co-operative group. Their territory extends from the southern half of the North Island to Marlborough, Nelson, and the west coast of the South Island. They sold 15,000,000 lb.

Private merchants, operating on a varying scale from a few in Auckland City to a number in Taranaki and one or two in small towns of both Islands, sold 6,000,000 lb.

Butter sold on the local market has to be graded on the same lines as export butter, and dairy companies receive an equal return for their product whether it is sold in New Zealand or exported. Accordingly, since the dairy company selling butter on the local market at present receives from the wholesaler a wholesale price equal to 1s. 6d. per pound, the Commission must pay to the dairy company, and recover from the Public Account, a "differential" of approximately 1s. per pound. The addition of this "differential" to the wholesale price will bring the total return to the dairy company up to the equivalent of the guaranteed price paid for produce exported.

CHEESE AND OTHER DAIRY-PRODUCE

Dairy companies may sell cheese and other dairy-produce for local consumption to any wholesaler, but the New Zealand Dairy Products Marketing Commission sees that quality is maintained. Dairy companies receive approximately 1s. 5½d. per pound for cheese, according to type, from the wholesaler, which at present is equivalent to the price received for export cheese. When there is a difference between the price received on the local market and the equivalent price for cheese exported, a differential is paid to bring the local price up to export level.

MILK

The distribution of liquid milk supplies was in such a chaotic condition in the early war years that in 1943 a Royal Commission was set up to investigate it. The Central Milk Council established by the Milk Act 1944 exercises a central guiding function, local control being effected through a series of milk authorities or Boards, which control the system of retail zoning that is still maintained. Town-milk suppliers have been obliged to form themselves into local co-operative milk-supply companies or associations, each association guaranteeing to the Milk Division of the Marketing Department the supply, at a guaranteed price, of a fixed quantity of milk daily. Individual producers in turn agree on their own daily quotas with the supply association in return for a guaranteed price. Milk is retailed at present at a fixed price of 4d. per pint, and retailers are allowed various fixed margins. The difference between the price paid to producers, plus margins, and the fixed retail price is borne by the Government through a subsidy.

The Marketing Department acquired the ownership of a number of milk-treatment houses. The policy now is to sell these to local authorities or to associations of producers.

WHEAT

Before the development of the freezing industry, New Zealand exported wheat and even wheat and flour to Australia. Export of considerable quantities of wheat continued until 1911, but from then on almost none was exported, except in 1922, 1929, and 1933.

The important factor in wheat production is the price of wheat compared with the price of other farm produce. Some of the largest harvests have been produced in slump periods, as wheat is the best crop to turn quickly into cash. Wheat has had to compete for land with fat-lamb raising and crops such as peas, linseed, and small seeds, which are produced more easily and are more remunerative in relation to outlay.

Protection for Growers

The first experience of Government control of wheat was from the latter part of the First World War to the harvest of 1922, after which there was a voluntary form of control until the harvest of 1924. After 1924 control ceased, but the fluctuating market for wheat, due to world-wide price movements, caused growers to press for some form of protection against such movements. The result was a sliding scale of duty on wheat and flour designed to adjust the duty payable so that the price of wheat was fixed at 5s. 8d. per bushel f.o.b. country of origin, with flour on a comparative basis. Because of the duty, New Zealand millers could afford to pay about 6s. f.o.b. South Island ports, but on 1 March 1932 the scale of duty was modified to give New Zealand growers 4s. 10d per bushel f.o.b. In fact, the sliding scale of duty provided no real protection, as no floor prices were fixed for New Zealand wheat, and flour could be imported to compete with the output of local mills. It was not until 1936 that an embargo was placed on the import of flour and the control of wheat imports was vested in the Wheat Committee. A voluntary organization of wheatgrowers was formed in 1929, but it was only partially successful until 1931, when all wheatgrowers and millers co-operated to form the Wheat Marketing Agency Co., Ltd. As a result of a request to the Government for a compulsory pool to handle all f.a.q. (fair average quality) milling wheat, the Wheat Marketing Agency Co. Ltd., was in 1933 merged into the Wheat Purchase Board, on which growers and millers had equal representation under a Government chairman. At the end of 1935 the name was changed to Wheat Committee, and in 1936 the Committee took over the responsibility of handling of all wheat and flour.

Wartime Increase in Acreage

During the Second World War, attempts were made to make New Zealand more independent of overseas supplies. With the beginning of stabilization came a period of fixing the price of wheat on the basis of cost of production. The appeal to the patriotism of farmers was successful, and appreciable increases occurred in the areas sown in 1939–40 to 1942–43, but since then the area has declined considerably, being in some years even less than half the areas sown during the early war years. Consequently, there has been a great increase in the quantity of wheat imported, and during the calendar years 1945–48 quantities of flour were also imported. (In 1939, 92,853 short tons of wheat and 20 short tons of flour were imported, compared with 148,240 short tons of wheat and 15,411 short tons of flour in 1945 and 172,195 short tons of wheat in 1949.)

On 1 August 1949 the International Wheat Agreement came into operation. New Zealand's quota, which comes from Australia, is 4,592,964 bushels per year at prices fixed under the agreement. In addition, the Wheat Committee is obliged to buy all f.a.q. New Zealand wheat offered by growers. To encourage the growing of wheat, incentive prices were offered during the 1950–51 and the 1951–52 seasons. The price of wheat to millers is considerably lower than that paid to farmers, the difference being met by a subsidy to prevent an increase in the price of bread.

All New Zealand milling wheat is purchased from farmers by the Wheat Committee through grain merchants. The Committee arranges for the processing of the wheat and the sale of the flour to merchants, bakers, pastrycooks, grocers, and others. The Committee is also responsible for the importation of any wheat and flour and the distribution of imported poultry wheat in the North Island; in the South Island poultry wheat is not controlled.

OTHER CEREALS

There is now no control on the marketing of cereals (barley, oats, maize) other than wheat.

Barley

Barley is grown largely under contract to grain and seed merchants acting as agents for brewers, and for feed or for sale as seed. Barley is the only cereal besides wheat for which prices are still fixed. Price Orders are issued for malting barley and feed barley, the maximum price paid to the grower for preferred malting varieties (first grade) being 83 per cent of the basic cost of production of wheat. The discount for non-preferred and feed varieties is 6d. a bushel.

Oats

Oats are marketed through grain merchants acting as agents for millers, and since December 1949 the price of oats has been decontrolled.

Maize

The Maize Marketing Committee, which had been responsible for the sale and distribution of all maize, has been disbanded, and the Price Order covering maize was repealed in June 1950.

POTATOES

As the output of potatoes varies considerably from year to year, some form of organized marketing is essential. During the war a representative body, the Potato Advisory Committee, advised the Marketing Department what acreages should be planted; the Government then set maximum prices for potatoes, based on estimated costs of production, and, through the Marketing Department, entered into contract with individual growers for the planting of specified areas. Growers disposed of the potatoes through ordinary trade channels, any suplus not sold by a certain date being paid for by the Government at the maximum prices, less any cost of production not incurred (for example, bagging). The grower was thus assured of being paid for his whole crop, even if there was no market for the potatoes.

Since the war the Government has gradually lifted wartime controls, but the industry did not wish to revert to pre-war conditions. In August 1950 a Potato Growing Industry Bill was passed under which a Potato Board was set up. This Board, which consists of three grower and three merchant representatives and an adviser from a Government Department, has taken over the marketing of potatoes from the Marketing Department. The Board's revenue is raised from levies on potatoes sold. The Board determines the acreages to be planted and enters into contracts with growers for the planting of these acreages. Although the Board is an independent body, it is required to report to the Minister of Marketing what areas have been contracted for and the total expected yield of potatoes, whether grown under contract or not.

The Board has not been given power to fix the maximum price of main-crop potatoes. however, this right still being vested in the Price Tribunal. The prices under the contracts must be related to the fixed prices, but may be below the maximum price on the market. Under the previous scheme the grower received payment at the full rate for all contract-grown potatoes, whether they were sold through ordinary trade channels or constituted a surplus.

EGGS

Egg-marketing policy is determined by a National Egg Marketing Committee, which consists of four producer members and a Government nominee. It is proposed that this body should become an entirely producer organization responsible to the industry and capable of negotiating with the Government. Producers may sell eggs direct to consumers, but such eggs may not be reoffered for sale in marketing areas which are serviced by "egg floors." These receive eggs from producers and distribute them to retailers. Producers in egg floor areas may not sell to retailers. Egg floors are privately or co-operatively owned.

Eggs surplus to local requirements are pulped, frozen, and sold ultimately to bakers and pastrycooks. No importations of eggs in shell, pulp, or powder are being made, as the industry is meeting the full Dominion requirements for all forms of egg products.

Eggs passing through egg floors are candled and graded before being distributed. The grades operating (March 1952) are: Special 2¼oz. and over, standard, 1⅞oz. to 2⅛oz.; medium, 1⅝oz. to 1⅞oz.; and pullet, 1¼oz. to 1½oz. Prices vary according to grade and season and are subject to a ceiling fixed by the Price Control Division on recommendation by the National Egg Marketing Committee. The latter endeavours to obtain an annual over-all price in line with the cost of production as accepted by the Government, but the Committee is not permitted to exceed this figure.

It is estimated that about 35 million dozen eggs are produced annually, of which about 16 million dozen pass through licensed egg floors.

POULTRY

Poultry marketed for human consumption is sold principally through public auctions conducted by merchants, the birds being sold on a commission basis. The Department of Agriculture has power under the Poultry Act 1924 to inspect birds at these auctions and to condemn for immediate destruction any birds considered to be suffering from disease. Since it is an offence against the Act to offer diseased birds for sale, no compensation is paid for any birds destroyed.

APPLES AND PEARS

Marketing of apples was not controlled until the Second World War. Before then growers could sell direct to retailers or consumers, they could sell by private treaty to co-operative or proprietary fruit merchants, or they could dispose of the fruit by auction, the method most commonly adopted.

From the outbreak of the war the economic stability of the fruit industry was in danger, as it had depended on the export of substantial quantities to stabilize market prices within New Zealand. A most serious situation arose because preference was given to meat and dairy-produce in the allocation of refrigerated shipping space. In these circumstances the Government agreed to purchase the whole crop at a fixed price, and even in the absence of export outlets it was found possible to absorb almost the total production of the industry. Dehydration factories were established, an apple-in-school scheme was inaugurated, and in the later stages of the war the United States Joint Purchasing Board took substantial quantities.

In 1944 a minimum guaranteed price was established by the Government, and realizations, if above that figure, were to be paid to growers. A subsidy of £169,000 per annum was added to the realizations of fruit in lieu of an increase in the consumer price. In 1947 a cost survey was carried out by the Department of Agriculture to determine the cost of production in various districts. The subsidy was withdrawn in 1948, and to give orchardists an average return comparable with 1947 the Government agreed to an increase in retail prices to operate on a sliding scale according to the period of the year. An Apple and Pear Marketing Board was established in 1948 at the request of the industry to take over the responsibility from the Government. The Board consists of two members nominated by the New Zealand Fruitgrowers' Federation, two members appointed by the Minister of Marketing, and an independent Chairman selected by the Minister after consultation with the New Zealand Fruitgrowers' Federation. The principal function of the Board is to acquire apples and pears grown in New Zealand or imported, and to market them in the Dominion and overseas. The fruit is acquired on a purchase basis, the price paid to growers being fixed by the Minister of Marketing after he has received the advice of the Board on the assessed cost of production for the season in question. The price fixed by the Minister has to be within the range of 6d. above and 6d. below the

standard cost. The standard cost for any particular year is calculated by applying current labour and material changes to the standard items laid down in the cost survey of 1947. The standard is the cost of production in the Hawke's Bay and Nelson districts, but the Board has power to pay growers in other districts an additional amount to compensate for the higher cost of production in such districts. The fruit bought by the Board is sold by private treaty, the price payable by retailers being set by the Board. Though the prices of apples and pears were decontrolled in 1950, it has been found that retailers are at present still applying a mark up similar to that permitted by the Price Tribunal.

The Marketing Department has been appointed agent of the Board until 1953 and carries out the physical handling of the crop, according to the general policy decisions of the Board.

OTHER FRUIT AND VEGETABLES

Fruit and vegetables other than apples, pears, lemons, and potatoes are marketed through ordinary channels. Large quantities of peas, tomatoes, raspberries, and black currants are grown under contract and sold to canning factories; the rest is sold privately or to merchants, who sell by auction.

All lemons are sold to the Marketing Department, which is also represented on the Hop Marketing Committee and the Nelson Raspberry Marketing Committee.

As from 1 January 1951 the importation and distribution of citrus fruits, bananas, and pineapples is controlled by a new public company, the shareholders of which are the fruit merchants who previously acted as wholesale distributors under licence from the Marketing Department. However, the Government is represented on the directorate, and to ensure the smooth working of the marketing scheme for local standard lemons, imports of lemons are to be made by the company only on Government order. The company has the sole right to import citrus fruits, bananas, and pineapples for five years, provision being made for termination of the agreement at twelve months' notice thereafter, though if the company does not carry out the terms expressed or implied in the agreement the Government may terminate the agreement before the five-year period has expired.

BOBBY CALVES

The Marketing Department is responsible for the administration of bobby-calf pools in such matters as the forming of pool areas, gazetting committees, receiving, and summarizing annual accounts, but has no responsibility for the sale of skins or meats.

HONEY

Wartime regulations requiring beekeepers to market the bulk of the honey through the Internal Marketing Division were revoked in 1945, and since then beekeepers have been free to sell their produce where they wish. The Marketing Department provides marketing facilities for those who require them and allots supplies received to hospitals, manufacturers, the armed services, and retailers, and for export.

AGAR AGAR

Before the war agar agar was imported, but local sources of supply are now being used as far as possible, thus effecting a saving in overseas exchange and providing a valuable source of income to part-time collectors, primarily Maoris. The Marketing Department acts as the sole collecting agency, and all agar agar purchased is sold to a factory in Christchurch.

TOBACCO

Contracts are entered into between growers and the four tobacco manufacturers for the growing and disposal of the tobacco leaf. The contracts state the acreage to be planted and the estimated yield and often also make provision for supply of seeds. A grower is required to obtain

from the Tobacco Board both a licence to grow and a warrant to sell tobacco. Manufacturers purchasing raw leaf are required to obtain a warrant to purchase.

The Price Tribunal fixes a minimum basic average price for flue-cured and air-dried leaf for each season. This minimum average price is not a guaranteed minimum payable to each grower, but is the minimum average price which each manufacturer must pay for his aggregate purchases from all his growers. Payment to growers varies according to grade of leaf and is determined by each manufacturer at the beginning of the season. If the manufacturer finds that his over-all price is less than that stipulated by the Price Tribunal, he is required to make an additional payment to each grower. A minimum price below which leaf cannot be sold was fixed in 1943, and still remains at 1s. 3d. per pound.

PRODUCER ORGANIZATIONS

FEDERATED FARMERS

FEDERATED Farmers of New Zealand, an organization with a membership of over 46,000, includes farmers engaged in all types of agriculture. The great proportion of the members, however, are engaged in sheep, dairy, or mixed farming, the last mentioned involving arable farming as well as dairying or sheep farming, or both.

The Federation is financed by direct subscription from members—at present on a sliding scale, according to size of holding, with a minimum of £1 10s. a year. It has provincial branches in 22 areas, which, again, have local branches in more than 500 places. The subdivision into provinces is arranged according to geographical considerations and consequently the provincial memberships range from 10,000 to 200. Auckland is the largest provincial area, accounting for one-quarter of the total membership of the organization. The activities of the local or district branches are many and varied and in addition to their functions as part of the Federation they act as local citizens' associations. They attend to the amenities of the district, and also constitute a district social centre.

The present organization of Federated Farmers is of comparatively recent origin, being, in fact, a development of the New Zealand Farmers' Union. In 1945 the structure of the Farmers' Union was altered to include the New Zealand Sheepowners' Federation and other national farming organizations in order to achieve as large a measure of unity among farmers as possible. To safeguard the particular interests of farmers engaged in specific types of farming, commodity sections were set up within Federated Farmers. At present these are a Dairy Section, an Agriculture Section, and a Meat and Wool Section, each of which is autonomous where matters affecting its particular branch of farming only are concerned. The Dominion Council of the Federation handles all national questions which impinge on the interests of more than one section of the Federation or which affect farmers generally. In this respect it acts as the agent for farmers on matters such as wage and price negotiations, taxation, and supply of raw materials. The Federation also works closely in conjunction with the New Zealand Dairy Board, the New Zealand Meat Producers Board, and the New Zealand Wool Board.

NEW ZEALAND DAIRY BOARD

The New Zealand Dairy Board was established in 1924 as the New Zealand Dairy-produce Control Board, consisting of twelve members, under the authority of the Dairy-produce Export Control Act 1923; its functions at that time were the control of export marketing of dairy-produce. After preliminary investigations and a short period of active participation in marketing it relinquished that field to private enterprise, but maintained control of shipping of produce, advertising, and insurance. From 1927 onward the Board additionally served the dairy industry by disseminating information regarding shipments, prices, and stocks of dairy-produce in different parts of the world and by encouraging dairy research and improvement in the quality of export produce. In 1934 a direct interest in marketing was resumed by supervision through the London office of the Board.

Under the Agriculture Emergency Powers Act 1934, introduced following the report of the Dairy Industry Commission, which investigated the affairs of the dairy industry in the same year, the name of the Board was changed to the New Zealand Dairy Board and it was reorganized with a membership of seven and given authority to regulate and control the production of dairy-produce in New Zealand and the handling, marketing, transport, and distribution of dairy-produce intended for consumption in New Zealand.

The reorganized Board of 1935 prepared comprehensive plans for both local and export marketing of dairy-produce and also co-operated with the Government in the zoning of supply to dairy companies to avoid overlapping. As a result of these activities many proprietary dairy companies were bought out and the industry became almost wholly co-operative. The marketing plan was to be brought into operation as from 1 August 1936, but with the change of Government in November 1935 a Marketing Department of State was established under the Primary Products Marketing Act 1936, which again drastically altered the constitution of the Board.

The Marketing Department assumed responsibility for the marketing of export dairy-produce and guaranteed prices for producers were established. The Government took over practically the whole organization of the Board, and by legislation provided that after 31 July 1936 the Board would exercise its functions only with the approval of the Minister of Marketing. The personnel was reduced to five; three members elected by votes of dairy companies in the northern, middle, and southern wards respectively, one appointed as representative of the New Zealand Co-operative Dairy Co., Ltd., and one appointed by the Government.

Voting both for election of members and in any poll that is taken at ward conferences is based on one vote per ton of butter or 2 tons of cheese, or 2,000lb. of butterfat comprised in any other manufactured product of milk or cream in annual output of each dairy company. Since the marketing functions of the Board were transferred it has become the mouthpiece of the dairy industry, after consultation with the Dairy Industry Council (which embraces members of the Board and representatives of the National Dairy Federation, South Island Dairy Association, and Dairy Section of Federated Farmers), in negotiations with the Government for the guaranteed price. The Board has also been given other functions in connection with the affairs of the industry, such as the control of herd-recording and the general policy of herd-improvement, including investigation of problems of production such as nutrition, breeding, fertility disease, and artificial insemination.

By the Dairy-produce Amendment Act 1948 provision was made for the members of the Board in office on 30 June 1949 to go out of office and be succeeded by eight members consisting of one Government appointee, two appointees of the New Zealand Co-operative Dairy Co., Ltd., one elected representative of North Auckland, one elected representative of South Auckland (excluding the New Zealand Co-operative Dairy Co., Ltd.), one elected representative of Taranaki, one elected representative of Wellington, including portions of Hawke's Bay, Marlborough, and Nelson, and one elected representative of the remainder of the South Island.

This alteration was provided to give effect to the wish of the industry to have an administrative head composed of members sufficient to give geographical coverage of the Dominion and maintain efficient contact with dairy companies and with the various associated and subsidiary organizations in which the Board is interested.

The Board collects general statistical information of interest and value to the dairy industry. It shares with the Government the management and finance of the Dairy Research Institute, and with the Government, the New Zealand Meat Producers Board, and the New Zealand Wool Board the control of the Veterinary Services Council.

The Dairy Board is also represented on the Meat Producers Board, the National Pig Council, the New Zealand Bobby Calf Pools central executive, the Dairy Factory Managers' Registration Board, and on committees recently set up to examine new buttermaking processes and mechanical improvements in cheese manufacture.

The Dairy Products Marketing Commission Act 1947 provided for the transfer of marketing of dairy-produce from the Marketing Department to the Commission. The Dairy Board was given the responsibility of selecting three members to be appointed by the Minister and was also consulted by the Minister about the appointment of a Chairman of the Commission.

Under the Dairy-produce Export Container Regulations the Board is given the responsibility of providing containers for all butter, cheese, and milk powder (other than that packed in tins) intended for export.

Under the Dairy Factory Supply Regulations 1936, Amendment No. 2 (1948/167), the Board is responsible for administration of the regulations governing zoning of supplies of milk and cream to manufacturing dairies, and the consent of the Board is now necessary before any licences can be given by the Director of the Dairy Division under the Dairy Factory Licensing Regulations for extensions or new buildings for manufacturing dairy factories.

The Board has recently arranged for the provision of a degree scholarship and twenty-four diploma bursaries per annum tenable at Massey Agricultural College to encourage promising young men engaged in the manufacturing side of the dairy industry to qualify by technical training for efficient work and leadership. The cost of this provision is being met equally by the Board and the Government.

NEW ZEALAND MEAT PRODUCERS BOARD

In the latter part of 1921 the meat producers of the Dominion were faced with unpayable prices for their stock, and at the unanimous desire expressed at a large and representative gathering the Government at that time passed the Meat Export Control Act, whereby the New Zealand Meat Producers Board was established to take control of the meat industry.

The personnel of the Board comprises five representatives of the meat producers of the Dominion, two producer representatives nominated by the New Zealand Government, one representative nominated by the stock and station agents, and one representative nominated by the dairy producers.

The five producer representatives hold office for two years and are elected by an Electoral College comprising twenty-five representatives of the meat producers of the Dominion, who are themselves elected on a district basis by sheepowners with flocks of one hundred or more sheep.

Most of the Board's activities have been directed along lines which could result in reductions of costs or which would, in other ways, increase the net return receivable by the farmer for his produce. This work may be grouped under the following main headings:—

1. Regulation of Shipments to Ensure a Stable Market

One of the most important functions of the Board has been to regulate shipments to keep a steady flow of meat to the British market over the twelve months of the year, having due regard to the months showing the highest consumption of each class of meat. The Board was able to carry out this work, as the freight arrangements for the shipment of all New Zealand meat were in the hands of the Board under its statutory powers.

2. Fostering Healthy Competition for Farmers' Products

The policy of the Board since its inception, to safeguard the interests of farmers, has been to endeavour in every way possible to create a healthy buying competition in the Dominion, and also by means of a carefully planned system of regulation of supplies, whereby periods of glut and scarcity are carefully guarded against, to ensure that a healthy competition also existed at its destination. The Board has also always maintained the "open door" as an alternative outlet for the farmer who wished to ship on his own account.

3. Reduction of Costs

A great deal has been done to reduce the excessive costs which existed in many directions, especially in the early days of the Board. A notable example in this respect was seen in the various shipping freight contracts negotiated by the Board in regard to shipping freight rates, resulting in substantial reductions in this important item of cost to the producer.

4. Maintaining, and if Possible Increasing, the Present Premium for Quality

At its inception the Board laid down standards of grading for export meat, and has since supervised the grading to ensure that these standards are strictly adhered to at all freezing-works. The Board has also done much to foster special attention to quality and grading by means of district competitions and in various other ways, including research work in the preparation and handling of our products.

5. Promoting Consumption by Advertising Propaganda

In pre-war days a very wide and varied field of publicity throughout Britain was covered by the Board's advertising propanganda to foster and develop the good will of the retailer and consumer alike.

6. Widening and Expanding the Outlets for Meat

The activities of the Board's travelling representative in the United Kingdom and the arrangement of special shipping facilities in pre-war days resulted in the distribution of New Zealand meat throughout England and Scotland being considerably widened. The Board also explored possible markets in North America and elsewhere by making trial shipments.

7. Bulk-purchase Contracts

The Board acts as the agent for the New Zealand Government in the administration of the bulk-purchase contracts for meat and tallow with the United Kingdom Ministry of Food.

NEW ZEALAND POULTRY BOARD

The New Zealand Poultry Board was established in 1934 under the Poultry Runs Registration Act 1934. The Act requires all persons owning twenty-five or more female poultry and offering eggs for sale to register and to pay a fee of 2s. 6d. per hundred birds or part thereof. The money collected is used to finance the Poultry Board. In addition, the Board receives the proceeds of a levy on pollard and bran used by poultry producers.

The Board consists of four producer members and two Government nominees. All members serve for periods of two years and are eligible for re-election by provincial producer organizations or re-nomination by the Government. The offices of the Board are in Wellington and meetings are held monthly.

The functions of the Board are to negotiate with the Government and Government Departments in all matters affecting the industry. The Board is also responsible for organizing the various provincial bodies within the industry and for arranging an annual Dominion conference at which delegates from all parts of New Zealand discuss policy matters.

NEW ZEALAND FRUITGROWERS' FEDERATION, LTD.

The New Zealand Fruitgrowers' Federation is the national, and fully co-operative, organization of the fruitgrowers of New Zealand. It was reconstituted in 1916, and is registered under the Industrial and Provident Societies Act 1908.

The only subscribed share capital is that subscribed by fruitgrowers' associations who are members of the Federation. Any fruitgrowers' association having a membership of not less than seven *bona fide* fruitgrowers may become members of the Federation by subscribing a £1 share. In general, a *bona fide* fruitgrower is recognized as one who pays the requisite orchard tax.

The orchard tax paid by fruitgrowers throughout New Zealand is at the rate of 2s. an acre, part of which is handed to the Federation for organization work, the balance being used by the Department of Scientific and Industrial Research for research work within the industry.

The objects of the Federation are very wide, some of which are to engage in any trade or business dealing with fruit or any other product of the soil; to carry on business as general merchants; to buy, sell, and distribute anything which may be of use to fruitgrowers; to promote, foster, and protect the fruit industry throughout the Dominion; and to arrange a closer bond of unity and co-operation among all engaged in the production of any kind of fruit or any other product of the soil.

Though the Federation's main purpose is not trading, it has nevertheless established a large trading organization, supplying growers with their requisites in sprays, fertilizers, packing materials, &c., and though individual growers cannot become members of the Federation, the Federation is at liberty to deal directly with fruitgrowers' associations or growers. Any profits made by the Federation are allocated to the growers at the conclusion of each financial year on the basis of their purchases from the Federation.

There are six directors, one from each of the main fruitgrowing provinces, who are elected by growers at annual conferences. These take place in each provincial district, usually during July, delegates being elected by their respective associations on the basis of one delegate for each ten members in an association. At the provincial conferences the annual order paper is considered and delegates to the Dominion conference held in Wellington during August are elected.

In addition to its trading activities, the Federation attends to the political side of the industry and negotiates with the Government on any matters of national importance.

The Federation has branches at Auckland, Hastings, Nelson, Motueka, Blenheim, Christchurch, Roxburgh, and Alexandra, and agencies at Kerikeri, Tauranga, and Gisborne, with its head office at Wellington. The Federation issues its own monthly magazine, *The Orchardist*, which is supplied free to all *bona fide* fruitgrowers paying orchard tax.

NEW ZEALAND WOOL BOARD

The New Zealand Wool Board was established by Act of Parliament (the Wool Industry Act 1944) to replace the New Zealand Wool Council as the statutory authority representing the woolgrowers of the Dominion.

The Board consists of six woolgrowers' representatives, two representatives of the Government, and the Director-General of Agriculture as associate member.

To elect the six producer members of the Wool Board there is an Electoral Committee of twenty-five members chosen by direct vote of the sheep-owners in the various districts of New Zealand. Every year three producer members of the Board retire, and at the annual meeting of the Electoral Committee an election is held to fill these vacancies. Each producer member of the Wool Board is elected for a term of two years.

Briefly the functions of the Wool Board are as follows:—

To promote the use of New Zealand wool in existing or new markets by publicity and other means.

To promote scientific or industrial research into wool and sheep problems.

To represent the woolgrowing industry in an advisory capacity to the Government.

To act with similar bodies in other parts of the world to further its objects. This refers to its association with the Wool Boards of Australia and South Africa in the maintenance and direction of the International Wool Secretariat.

In New Zealand the Wool Board carries on publicity for wool through newspapers, magazines, and radio. Its promotion work takes the form of fashion shows, scientific displays, talks, films, posters, and educational material. It offers bursaries for wool scientists to study overseas and then return to New Zealand.

As part of its general function of representing the wool-growing industry the Board has representation on five other organizations. They are:—

(1) The New Zealand Meat and Wool Boards' Economic Service, set up by the two Boards in 1950 to collect and provide useful data on the sheep-farming industry in all its branches.

(2) The New Zealand Woollen Mill Owners' Research Association, which maintains and directs a research and service laboratory at the University of Otago. In this enterprise the New Zealand woollen-mill owners are partners with the Wool Board and the Department of Scientific and Industrial Research.

(3) The Veterinary Services Council, which encourages the provision of efficient veterinary services for owners of live-stock in New Zealand.

(4) The Roster Committee, which draws up and supervises the wool sales dates in New Zealand.

(5) The Wool Commission, the principal function of which is to ensure a certain price each season for wool.

YOUNG FARMERS' CLUBS

For a number of years the Department of Agriculture has fostered the development of the New Zealand Federation of Young Farmers' Clubs. Clubs may be formed in any district, the only requisite being a minimum number of ten young farmers between the ages of fourteen and thirty.

Before the Second World War there were 203 clubs with active membership exceeding 6,000, linking up most farming districts. During the war more than two-thirds of the clubs were forced into temporary recess, as about 3,500 members entered the services. Nevertheless the organization was kept alive, and with the return of members from overseas there was a rapid revival. At present there are more than 330 clubs with a total active membership of about 10,000, as well as a substantial honorary and advisory membership.

The aim of the movement is to promote agricultural education and to develop interest in the well-being and advancement of farming; to foster a spirit of leadership and self-reliance among the youth of the rural community; and to encourage social and recreational activities throughout the country districts.

Club Activities

Activities are directed mainly toward agricultural instruction, but the social and cultural sides are not neglected. Clubs hold regular meetings, which consist mainly of lectures, demonstrations, discussions, and debates. The business part of meetings provides excellent training in meeting procedure. The movement is completely non-sectarian and non-party-political and subjects which violate this policy are prohibited at club meetings.

Field days are held periodically—usually visits to outstanding farms, where the agricultural instructors and experienced farmers deal with matters such as pastures, crops, live-stock, or new machinery. Clubs are also developing social activities, including sports meetings, dances, and social evenings.

District Activities

District committees are set up in over forty areas, their responsibility being the fostering of clubs within their districts. Their activities include educational weeks, stock-judging contests, pasture and crop competitions, inter-club debates, district field days, machinery displays, and educational tours. Parties of up to fifty young farmers travel to other farming districts or to industrial areas, and in some cases are billeted with Y.F.C. members *en route*. Some district committees arrange for radio talks to be given by members in Y.F.C. and other farming sessions.

The Y.F.C. has raised through its members £20,000 to establish a national Y.F.C. war memorial, which will take the form of buildings at Massey and Canterbury Agricultural Colleges to provide facilities for special Y.F.C. short courses.

Organization and Constitution

Clubs elect their own officers and conduct their own affairs, subject to guidance from their federation. Each club sends delegates to its district committee, which administers an area corresponding to an instructorate of the Extension Division of the Department of Agriculture. Field officers of the Division act as district Y.F.C. secretaries. In addition to club representatives, district committees include co-opted members, who may be farmers over Y.F.C. age or members of Federated Farmers or agricultural and pastoral associations. Each district committee sends three delegates to its respective council, of which there are four, Auckland, Wellington, Canterbury, and Otago-Southland. The area covered by each council is equivalent to that of a Fields Superintendent of the Department of Agriculture, and each Fields Superintendent is an *ex officio* member of a council and of all its district committees.

The Dominion Executive Committee (which is in effect the controlling body of the organization) is composed of the four council chairmen, three delegates from each council, the Director of the Extension Division of the Department of Agriculture, a nominee from each of the two agricultural colleges (Massey and Canterbury) and two from Federated Farmers, and the Dominion president, vice-president, and immediate past-president.

TOBACCO BOARD

The Tobacco Board was formed in 1936 under the provisions of the Tobacco Growing Industry Act 1935. The Board consists of a Government representative, who is Chairman, four representatives of the growers, and four representatives of the manufacturers. No person may grow, sell, or buy tobacco without a licence from the Board. In addition to the fees collected by the Board, there is a levy of ½d. per pound on raw tobacco sold. Out of this levy ¼d. per pound is transferred to a crop insurance fund operated by the Board and subsidized by the Government. Damage by frost and hail is often substantial.

The Tobacco Board is represented on the Tobacco Research Committee.

NATIONAL PIG INDUSTRY COUNCIL

Although the pig was perhaps the first domestic animal put ashore in New Zealand, it has been the one which has lagged behind in the development of New Zealand's primary industries. All the arguments that can be brought forward about lack of overseas trade, lack of refrigerated space, &c., are just as true for other classes of meat as they are for pigs, but, in spite of all this, other industries prospered and the pig industry was left behind.

From time to time this stagnation, coupled with the tremendous waste of dairy by-products, caused prominent farmers to try various schemes to promote interest in this neglected sideline.

The first real expression of this thought was the formation of the Waikato and Manawatu Pig Recording Associations in 1928. The thousands of sows recorded and the performances secured under reasonable conditions were such that the promoters had reason to be proud of their efforts. These results interested the thinking farmers, who realized that a very valuable sideline had been overlooked. The size of the possible trade was clouded only by lack of ability to supply the desired type of carcass in sufficient numbers. To correct this position some national effort was necessary, and this led to the formation of the National Pig Industry Council in 1936.

How the Council Functions

The Council consists of about twenty-seven members under the chairmanship of the Director-General of Agriculture, and represents all interested in pig production. There are about thirteen producer representatives from district councils, pig breeders, Federated Farmers, Dairy Board,

and Meat Board; six representatives of the trade (that is, exporters, freezing companies, bacon-curers, grain merchants, stock firms, and Pig Marketing Association); three representatives from the Departments of Scientific and Industrial Research, Marketing, and Agriculture; and representatives from the agricultural colleges, the Buttermilk Producers' Association, the Municipal Association of New Zealand, and the Federation of Young Farmers' Clubs. This council meets perhaps once a year and its executive consisting of the nine district Council representatives meets periodically.

How Funds are Provided

To provide funds for the National Pig Council, a levy of 6d. is imposed on all pigs slaughtered. This is collected from the various killing plants by the Department of Agriculture and transferred to the Council, which in turn hands it to the various district Councils, who spend it in carrying out the policy laid down by the management committees.

Winding-up Recommended

Winding up of the Council and the assuming of its functions by the New Zealand Dairy Board were recommended by the Council in 1952. Legislation will have to be passed to implement the recommendation.

District Pig Councils

In order to make contact with the producer the National Pig Council has set up nine district Councils, one in each of the following centres: Whangarei, Pukekohe, Hamilton, Whakatane, New Plymouth, Palmerston North, Gisborne, Christchurch, and Dunedin, alloting territory to each on the basis of pig population and area in such a way as to cover the whole of New Zealand as fairly as possible. Each district Council receives up to £1,500 a year and employs a secretary and supervisor to carry out the instructional work the National Council considers best, activities being subject to the approval of the National Council.

Just as the National Council distributes its activities among the nine district Councils, so does the district Council go further afield, until it gets to the actual producers. This is done by the district Council forming pig clubs.

Pig Clubs

A pig club consists of any number of producers in a locality who establish and subscribe to a fund through which they procure a pedigree sow, whose progeny is used for supplying members with breeding-stock. The sow is placed in charge of a custodian, who is paid for his services on the basis of pigs produced. These clubs are useful because:—

(*a*) They set a standard of quality of breeding-stock in any district.

(*b*) They set a standard of equipment.

(*c*) They are co-operative societies run only for the benefit of the members of the club.

(*d*) They are a means of getting uniformity in the pigs produced.

(*e*) They are a meeting place for the exchange of ideas.

(*f*) They are a centre from which the District Supervisor can give service.

National Service of Instruction

The intention of the whole organization is to provide the means for those who find the levy to have an opportunity of saying exactly how the fund should be used. Tentative rules for the conduct of pig clubs, district Councils, and the National Council have been formulated as a guide, but it is competent for any of these organizations to amend them where necessary, provided always that the general applicability of the amended rules is maintained.

AGRICULTURAL RESEARCH

RESEARCH in all matters pertaining to agriculture and horticulture (including research on qualities in the finished product) is carried out by the Department of Agriculture and the Department of Scientific and Industrial Research, together with certain independent and semi-Government institutions.

DEPARTMENT OF AGRICULTURE

The Department of Agriculture has the following research stations under the control of its various Divisions:—

ANIMAL RESEARCH DIVISION

The Animal Research Division was established in 1939 with a view to co-ordinating all departmental animal research work, some of which dates back many years. The work of the Division is organized round the following research stations, though other investigations are carried out wherever they become necessary.

Wallaceville: Situated about twenty miles north of Wellington, this station has well-equipped laboratories and about 100 acres of land. It is the main centre for the investigation of animal diseases, and has well-staffed sections dealing with pathology, bacteriology, parasitology, biochemistry, and apiculture.

Problems under investigation include facial eczema and other pathogenic photosensitizations, anaerobic diseases of sheep, salmonella infection of pigs, sheep, and cattle, mastitis of dairy cattle, milk fever and grass staggers in dairy cows, infectious abortion in cattle and sheep, infertility in rams, red water in calves, trace element deficiencies, rickets in lambs grazing on green cereals, footrot in pigs, parasites, and poisoning of live-stock.

The diagnostic section at Wallaceville makes a comprehensive laboratory examination of specimens submitted by veterinary surgeons and live-stock instructors and collaborates with them in the diagnosis, prevention, and treatment of stock ailments.

Ruakura: Situated about three miles from Hamilton, this station has about 1,000 acres of good grazing land carrying 500 dairy cattle, 100 beef cattle, 2,000 ewes, and 200 pigs. Although laboratory accommodation is not yet adequate, the station is otherwise very well equipped for the study of problems of animal husbandry, animal breeding, and animal nutrition. Because of the paramount importance of pasture in New Zealand, Ruakura is devoted almost entirely to studies relating to the interactions of grazing animals and permanent pastures.

Problems under investigation include nutrition of breeding-ewes, fecundity in ewes, biochemical studies of pathogenic photosensitization, artificial insemination of dairy cattle, infertility in dairy cattle, genetics of milk secretion in dairy cattle, grazing behaviour of dairy cattle, nutrition of dairy cattle, machine milking, lactation of sows, and nutrition and breeding of pigs.

Whatawhata: Situated about twelve miles from Hamilton, this station, which was purchased in 1949, is a typical hill property of about 1,300 acres. It is being developed for the study of hill-farming problems.

Problems under investigation include fertility of ewes, wool production, bearing trouble (inversion of vagina) in ewes, and beef production by cattle used for fern control.

Manutuke: Situated about nine miles south of Gisborne, this station was purchased in 1944 primarily for the study of facial eczema. It has an area of 68 acres of first-class land subdivided into thirty paddocks. In addition to studying the field aspects of facial eczema, the station

supplies material for pathological and biochemical studies of this disease at Wallaceville and Ruakura. Studies are also in progress relating to the nutrition of ewes and fat lambs on special pastures and crops.

EXTENSION DIVISION

Each year the Extension division has about 1,000 field trials in operation. Over 75 per cent of these are co-operative trials on farms and cover pasture production and improvement, responses to fertilizers and lime, yields of new varieties of annual crops, and weed control. More complex trials to study problems of soil fertility and crop and pasture production are carried out on the Division's research stations.

Hamilton: The Rukuhia Soil Research Station, near Hamilton, was established in 1946 and investigates problems of soil fertility. Attached to it are the Division's service and research laboratories. Considerable attention is being paid to the problems of developing Waikato peat lands.

Ashburton: The Winchmore Irrigation Research Station, near Ashburton, is investigating soil-fertility and crop- and pasture-production problems on irrigated land. In association with research, farm-management problems in dairy-farming and mixed farming are receiving attention on separate units.

Palmerston North: This is the site of the Seed Testing Station, which is the "backbone" of seed certification described on pages 71–72. The station functions primarily as an extension service, but in addition a certain amount of research is covered.

Marton: For many years the Marton Experimental Area has been used for detailed investigations of pasture production and fertilizer and lime responses, and for annual crop trial work.

Taieri: The Invermay Agricultural Research Station, near Taieri, deals with soil-fertility and crop- and pasture-production problems in Otago. The station was established in 1950 and is not yet equipped with laboratories.

Demonstration Farming: The Division is associated with the management of the Northern Wairoa, Stratford, and Waimate West Demonstration Farms and conducts investigational work on these farms. Experimental work is also carried out on the Division's Flock House Farm of Instruction.

HORTICULTURE DIVISION

Though the Horticulture Division has two main research stations, at Te Kauwhata and Levin, a good deal of research is covered by maintaining very close liaison with appropriate divisions of the Department of Scientific and Industrial Research.

Te Kauwhata: The Te Kauwhata Horticultural Station was specially established to undertake research into grape growing and wine making.

Levin: At the Dominion Horticulture Station at Levin work on berry fruits and vegetables chiefly is done.

Invermay: On this new station it is intended to study the problems of bulb-growing.

Wallaceville: At the Animal Research Station, Wallaceville, research on diseases of bees and improvement of bee stock is being undertaken.

Hamilton: The Rukuhia Soil Research Station assists with problems affecting the production of vegetables.

DAIRY DIVISION

Most of the work connected with dairying is covered either by the Animal Research Division or the Dairy Research Institute (see page 147). A Dairy Division officer (Dairy Factory Superintendent) is attached to Massey Agricultural College and acts as liaison officer between the Dairy Division and the Dairy Research Institute. Nevertheless, the Dairy Division has found it convenient to have a laboratory at Wallaceville to carry out certain tests and other work connected with the dairy industry.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

The Department of Scientific and Industrial Research covers a wide field of agricultural and horticultural research. Close liaison is maintained with the Department of Agriculture. In some fields the latter Department acts as a link connecting the pure research activities of the D.S.I.R. and their application by farmers and growers. The following is a list of the agricultural research branches of the D.S.I.R. with a brief account of their main activities:—

Botany Division: The headquarters are at Wellington, with experimental areas at Foxton (*Phormium tenax*) and Lower Hutt. The main subjects of study are taxonomic and economic botany of indigenous and introduced plants, plant ecology, peats, pollens, phormium, and seaweeds. The Division maintains a plant-introduction register and has a herbarium of over 70,000 specimens.

Crop Research Division, Lincoln: This Division now comprises the former Agronomy Division and the wheat-breeding section of the Wheat Research Institute. There are substations at Papatoetoe (vegetables and potatoes), Havelock North (vegetables and peas), and Gore (brassica crops and oats). Research is concerned with the improvement of field crops and vegetables.

Entomological Research Station, Nelson: The headquarters are at the Cawthron Institute, with a substation at Ashburton specializing in pasture insects. Research covers the taxonomy, biology, and ecology of economic insects and their control.

Fruit Research Station: The headquarters are at Auckland, with research orchards at Oratia, Havelock North, Appleby, and Earnscleugh. The work covers varietal studies, cultural trials, and physiological problems.

Grasslands Division: The headquarters are at Palmerston North, with substations at Lincoln and Gore. The Division conducts general pasture research, including the breeding of improved strains of grasses and clovers and the improvement of pasture management and utilization, together with associated physiological and chemical studies. The Plant Chemistry Laboratory has now been amalgamated with this Division.

Hop Research Station: This station at Riwaka, in collaboration with the Cawthron Institution, the Crop Research Division, and the Dominion Laboratory, has begun work on breeding and selection and on the improvement of cultural and drying practices.

Plant Diseases Division, Owairaka, Auckland: The Division is responsible for research into the nature and control of fungous, bacterial, and virus diseases of plants and associated work on the taxonomy, biology, and ecology of the causal organism. It maintains a certification system for spray materials and is the advisory authority on plant quarantine.

Soil Bureau: The headquarters and laboratories are at Wellington and there are district offices at Whangarei, Rotorua, Hastings, Christchurch, Timaru, and Alexandra. The Bureau is responsible for the mapping and classification of the soils of New Zealand and also conducts associated chemical, physical, and biological investigations.

Tobacco Research Station, Riwaka: Research is carried out jointly by the staffs of this station, the Cawthron Institute, and the Dominion Laboratory. It covers disease, nutritional, cultural, breeding, and curing problems.

Wheat Research Institute, Christchurch: The Institute is established for research and advice to industry on cereal, chemistry, milling, and baking problems.

OTHER RESEARCH INSTITUTIONS

Other institutions concerned with various phases of agricultural research are as follows:—

The Cawthron Institute: This Institute was founded in 1920 as a result of a bequest from the late Thomas Cawthron. It engages in several phases of research and collaborates closely with the D.S.I.R.

The more important insect investigations conducted by the Cawthron Institute at the present time relate to the control of gorse by the liberation of the gorse seed weevil, the control of St. John's Wort by the introduction of the beetle *Chrysolina hyperici*, and the control of the horntail borer affecting *Pinus radiata* by the introduction of the *Rhyssa* parasite.

In the soils department, detailed soil surveys for tobacco and hops, land utilization studies of the Moutere soil formation, Nelson, and the control of tomato soil diseases by steaming and the use of soil disinfectants are major activities.

In the plant chemistry department, studies of trace-element deficiencies in Nelson crops are being continued. Recently boron deficiency on a widespread scale has been identified in both raspberries and hops. Studies of zinc and copper contents of apple leaves and fruits and investigations concerning the chemistry of the tobacco plant and the effect of fertilizers and curing on its composition are being continued.

In the mycological department the more important investigations relate to the incidence and control of mosaic, black root rot, and wilt of tobacco, the incidence of collar rot and other diseases of fruit-trees, and the control of black root rot and other diseases of hops.

The Dairy Research Institute: This Institute, located at Massey Agricultural College, is an incorporated body which is controlled by a Board comprising three members nominated by the New Zealand Dairy Board, two by the Minister in charge of the Department of Scientific and Industrial Research, and one each by the Minister of Agriculture, the Minister of Marketing, Massey Agricultural College, and the New Zealand Dairy Factory Managers' Association.

The Institute is the principal centre for research work on the manufacture of dairy products, and research work carried out in recent years has embraced many aspects of cheesemaking, buttermaking, and the storage of dairy products.

The Institute also undertakes investigational work dealing with the utilization of dairy by-products, the suitability of types and models of dairy machinery and other engineering problems affecting the dairy industry, the production of milk in relation to feeding and management of dairy animals, factors influencing yield and composition of milk, and the effects of production on the yield and quality of dairy products.

Massey and Canterbury Agricultural Colleges: Massey College, Palmerston North, and Canterbury College, Lincoln, undertake a considerable amount of independent research as well as collaborating with State Departments.

Large-scale projects in hand at Massey College include further and more extensive trials with Cheviot sheep and their crosses with the Romney on deteriorated marginal hill country. These trials were begun in 1938, and results now indicate that, on economic grounds, there is a definite place for this cross on the poorer hill country of the North Island. The Galloway–Aberdeen Angus cattle cross is also being tried on similar country with the object of determining whether a hardier type of cattle beast will prove more profitable under hard conditions. Further long-range work on sheep-husbandry problems includes studies on the inheritance of meat and wool characters in Romney sheep, which has as its basis an investigation of the possibilities of progeny testing; causes of wear in sheep's teeth; factors influencing the milk yield of Romney ewes; anaerobic infections; the epidemiology of worm parasites; and metabolism studies on carotene.

Results of research to date on problems associated with tile and mole draining have been included in a comprehensive bulletin on farm drainage published recently, and are being rapidly incorporated into farming practice. The growing of pampas grass (*Cortaderia selloana*) has been undertaken with a view to studying fertilizer and management practices, selection of the more palatable and highly productive strains, and possible use of the crop on hill country for the wintering of beef cattle.

In the soils department, research is being carried out on the fixation of phosphates in the soil and on the potash status of a number of North Island soils.

The fundamental action of hormone weedkillers is also receiving a considerable amount of attention.

In dairy-cattle breeding Massey College is using a succession of proven Merit sires to build up high-producing pedigree Jersey and Friesian herds and thereby to make available to the industry young bulls of potentially high breeding worth. In addition, studies are being made of the structure of the main pedigree dairy populations in New Zealand in an attempt to elucidate and evaluate past and present breeding practices.

Research is proceeding on the bacteriological quality of milk and its products, oxidation defects in butter, and the commercial and economic aspects of current dairy practices.

The poultry farm is improving the strains of the breeds of poultry kept by trap nesting and progeny testing. Work on improvement of the egg production of the auto-sexing Legbar breed is continuing.

Massey College is becoming recognized as an important research centre for rhododendrons, azaleas, and roses. Work is proceeding on the introduction to New Zealand and the breeding and propagation of new varieties of these plants. All aspects of rose culture are being studied following the establishment at the college of the national rose-trial grounds.

Progress is being made in the solution of general and particular problems concerning the propagation of plants, including certain important commercial varieties.

Research activities at Lincoln College cover a wide range in accordance with the interests and degree of specialization of the staff of the college. Many aspects of pasture establishment and management, and factors affecting soil fertility and the influence of the latter on crop production, are being studied. The part played by bacteria in the soil and by bacteria, fungi, and parasites in diseases of crops is also under investigation.

Considerable emphasis is placed upon research in animal husbandry. In this connection the whole of the college's Ashley Dene flock of approximately two thousand sheep is devoted to experimental work. The main lines of research comprise progeny testing in Corriedales, the influence of breed of sire upon fat-lamb production, the part played by nutrition in wool and fat-lamb production, the influence of method of rearing hoggets upon their fertility as two-tooths and also upon their subsequent lifetime production, and the value of mineral supplements. In addition, experiments are being conducted at the college upon various aspects of metabolism in sheep. Identical-twin dairy cattle are being used to study pasture-hormone-milk output relationships.

ADULT AGRICULTURAL EDUCATION

A THOROUGHLY practical education in farming and facilities for the study of related sciences are provided by the constituent agricultural colleges of the University of New Zeland: Canterbury Agricultural College (Lincoln) and Massey Agricultural College (Palmerston North).

The present comprehensive courses, extensive services, and well-equipped establishments of these two colleges have evolved from efforts made very early in New Zealand's history to provide a thorough grounding in agricultural science, and to-day both education and research are faithfully carried on under highly qualified staffs at both colleges.

The granting of a University degree in agriculture for the first time in 1913 was of considerable significance, the status of agricultural education being thereby recognized, and the degree course so instituted has grown in importance ever since.

Courses are provided at the agricultural colleges for the degrees of Bachelor and Master of Agricultural and Horticultural Science; diplomas in agriculture, valuation, farm management, and dairy manufactures; courses in poultry-farming, wool-classing, horticulture, and herd-testing; cadet courses and short courses in dairy and sheep farming, and special courses for ex-servicemen and women. Facilities are provided for advanced studies leading to the Ph.D. degree.

Former students of the agricultural colleges are scattered throughout New Zealand and abroad. Many have been markedly successful in farming and others in important administrative and technical posts. Their success bears testimony to the thoroughness of agricultural education in New Zealand.

FLOCK HOUSE

As a farm training centre for overseas boys Flock House station was established in 1924 by the trustees of the New Zealand Sheepowners' Acknowledgment of Debt to British Seamen Fund, and was acquired by the Government in 1937. As circumstances changed the course of training was made open to New Zealand boys of from fourteen and a half to eighteen years, the aim being to give an initial grounding in all branches of farming, the Department of Agriculture undertaking to find suitable employment for each trainee on completion of the course.

WAIRARAPA TRAINING FARM

The Wairarapa Training Farm of Instruction provides practical instruction for youths of from 15 to 18, who do a two-year course. The property is farmed on commercial lines. Originally it was purchased by public subscription for the training of servicemen of the First World War, and it was used for a similar purpose after the Second World War. The farm has been conducted on present lines since 1951.

TECHNICAL CORRESPONDENCE SCHOOL

The Technical Correspondence School of the Education Department offers courses in agricultural subjects for adults who cannot attend classes at technical colleges because of such reasons as distance, hours of work, or ill health.

FUTURE OF FARMING AND PROSPECTS FOR IMMIGRATION

THERE will undoubtedly be some readers, particularly in parts of the United Kingdom, who will be interested in the prospects for the farmer-settler. It is not possible to attempt to cover all the problems with which the farmer-settler may be confronted, but a brief summary will give the general picture.

New Zealand's prosperity is inseparably bound up with the land. Farm production per unit of labour is the highest in the world, but there is little doubt that per-acre returns in terms of dairy-produce and meat could be raised considerably in a relatively short time if adequate fertilizer and other supplies, and labour, were available.

The main problem to be dealt with is the economic utilization of the hill country, which makes up nearly three-quarters of the total area occupied. Though much of the very steep and poorest hill country probably should be re-afforested or permitted to revert to native bush (forest)—of which it should probably not have been denuded—it is known that a great deal of hill country is capable of supporting good-quality pastures and of carrying reasonably large numbers of sheep and cattle. For a number of years research work has been undertaken on the establishment of improved pastures on this hill country, and in recent years this work has been intensified.

PROSPECTS FOR IMMIGRANTS

It cannot be emphasized too strongly that farming in New Zealand is predominantly pastoral, that the population is small and likely to remain so for many years, and that in consequence opportunities in small-scale, specialized farming are strictly limited. Opportunities exist, however, for farm workers or young men willing to become farm workers. Minimum payments to farm workers are fixed by law, and while the range of payments varies according to age and sex, minimum payment for adult workers on sheep farms is £6 2s. 6d. a week and on dairy-farms £7 5s., with keep. The latter is officially valued at £1 8s. 9d. a week, but in practice it is worth £2 a week or more. Thus the farm worker receives a wage equivalent to £9 a week in the city or town, plus paid annual holidays.

The dairy-farm worker, too, is in a position to "milk on shares" for a farmer with a large herd, receiving 40 per cent or more (according to agreement) of the gross returns. A large number of dairy-farmers in New Zealand started as sharemilkers. Farmers usually enter into share-milking agreements with married farm workers only.

Prospects of acquiring a property are fair for immigrants who in their late teens or early twenties begin working on farms and remain at this work for a number of years to gain experience and add to their capital. In general, prospects are better in dairying than in sheep farming, because considerably more capital is required for the latter.

It is very difficult to give any estimate of the amount of capital required to begin farming. Purchase prices of farms vary with types of farming and as between individual farms, even in the same district. In general, however, prices for holdings of minimum economic size range from £3,500 to £4,500 for poultry-farms up to approximately £8,000 for dairy units on land of average quality. These prices are exclusive of the cost of stock and farm equipment. The price of sheep-farms is much higher. The immigrant farmer is warned against being tempted to buy a small unit because of the lower initial cost.

It should be realized that lack of capital does not constitute an insurmountable barrier to the young, strong immigrant who is prepared to start at the bottom and work up.

Further information on farming prospects is obtainable from the Immigration Division of the Department of Labour and Employment, P.O. Box 6310, Te Aro, Wellington C 2, New Zealand. United Kingdom residents may communicate with New Zealand House, 415 The Strand, London W.C. 2.

SOURCES OF INFORMATION

Statistical and other information contained in this publication was obtained from a variety of sources, and it has not been considered practicable to acknowledge each source throughout the text.

Agricultural and pastoral statistics are collected annually in New Zealand, originating from two different sources: Figures of sheep numbers are collected under the authority of the Stock Act, which is administered by the Department of Agriculture; other agricultural and pastoral statistics are collected by the Census and Statistics Department under the authority of the Census and Statistics Act.

Each year every sheep-owner is required, under the Stock Act, to complete a return (popularly known as a "sheep return") showing the total number of sheep he owns, with a fairly comprehensive break up as between the various breeds and also as between the various types. A distinction is also made between stud sheep and others. The information is collected by live-stock instructors and the completed schedules are analysed and the returns compiled by the Census and Statistics Department. The statistical unit of area for all data is the county and the majority of tables are also totalled on a land-district basis.

The Census and Statistics Department is responsible for the collection and compilation of an annual census of agriculture covering more than 80,000 farm holdings in the Dominion. The field work of this collection is carried out by police officers acting as sub-enumerators of agricultural and pastoral statistics. The main method of collection is by post, personal canvass being made only where this is necessary to ensure that the schedules are adequately completed. The areas covered by the collection do not include holdings of less than 1 acre, holding inside borough boundaries, and small areas, wherever situated, used exclusively for residential, ornamental, or pleasure purposes (unless live-stock were depastured there on 31 January). Land held by Maoris on the communal system and unoccupied Crown land are not enumerated.

Agricultural and pastoral statistics are collected in February, generally for the year ended 31 January, though in the case of arable crops the figures will refer to the current season. In the annual collection, ten aspects are dealt with under the following headings:—

(1) Area, tenure, and purpose of holding.
(2) Area and yield of field crops.
(3) Summary of total area of holding.
(4) Grassland top-dressed.
(5) Farm machinery.
(6) Live-stock on holding.
(7) Stock slaughtered on holding for human consumption.
(8) Farm employees.
(9) Poultry.
(10) Irrigation.

In addition to the main annual collection, certain subsidiary inquiries are normally undertaken throughout the year. In the spring (September) information regarding wheat, oats, barley, and potatoes sown, or intended to be sown in the season then commencing, is obtained from farmers who grew these crops during the preceding season. This information is published in the *New Zealand Gazette* toward the end of October. At the end of January estimated average yields per acre are obtained through officers of the Extension Division of the Department of Agriculture. These estimates are used in conjunction with the previously estimated crop areas to compile total production estimates in respect of wheat, oats, and barley. The resultant figures are published in the *New Zealand Gazette* early in February.

Potatoes, which are largely unharvested at the time of the main collection, necessitate a post-harvest (July) inquiry to growers relating to the quantities dug, varieties grown, &c. Summarized results of this inquiry are published in the *Monthly Abstract of Statistics*.

As with the sheep returns, agricultural and pastoral statistics are compiled on a county and land-district basis.

All information in this publication relating to areas and yields of crops, areas in pasture, &c., numbers of live-stock (except sheep), areas of grassland top-dressed, and quantities of machinery on holdings has been taken from the annual statistical report on agricultural and pastoral production compiled by the Census and Statistics Department.

Data relating to exports and imports, consumption levels, and the production of commodities such as fertilizers have been abstracted from *Trade and Shipping*, *Factory Production*, the *Monthly Abstract of Statistics*, and the "New Zealand Official Year-Book," published by the Census and Statistics Department, and acknowledgment is made to the Government Statistician for the use of the material.

Statistics of live-stock slaughterings, total meat production, total butterfat production, and the manufacture of butter and cheese are compiled by the Department of Agriculture.

Acknowledgments are also made to the following Government Departments and to other organizations for information supplied:—

The New Zealand Forest Service.
The Fisheries Section of the Marine Department.
The Health Department.
The Department of Scientific and Industrial Research.
The Dairy Research Institute.
Cawthron Institute.
Massey Agricultural College.
Canterbury Agricultural College.
The producer Boards and marketing organizations.

STATISTICAL APPENDIX

TABLE 51—LIVE-STOCK NUMBERS

(thousands)

(Including estimate for stock within boroughs)

Year.	Cows in Milk.*	Total cattle.*	Total sheep.†	Breeding-Ewes.†	Lambs Tailed*
1920	783	3,102	23,915	11,569	9,448
1925	1,196	3,504	24,548	13,715	11,467
1930	1,389	3,766	30,841	17,564	14,888
1935	1,828	4,293	29,077	17,812	15,689
1940	1,740	4,533	31,063	19,728	17,230
1945	1,700	4,628	33,975	20,866	19,453
1946	1,683	4,704	Not collected	Not collected	19,561
1947	1,678	4,671	32,682	20,744	18,642
1948	1,734	4,753	32,483	21,055	19,835
1949	1,767	4,760	32,845	21,500	19,806
1950	1,866	4,986	33,857	21,881	21,170

* As at 31 January. † As at 30 April.

TABLE 52—GROSS MEAT PRODUCTION

(Carcass weight equivalent, inclusive of offals)

(Seasons ended 30 September)

Season. Average of	Long Tons.	Million lb.	Season.	Long Tons.	Million lb.
1936–37 to 1938–39	470,000	1,054	1944–45	537,000	1,203
1939–40*	535,000	1,198	1945–46	541,000	1,212
1940–41*	515,000	1,154	1946–47	560,000	1,254
1941–42*	535,000	1,198	1947–48	549,000	1,230
1942–43	537,000	1,202	1948–49	556,000	1,246
1943–44	508,000	1,138	1949–50	577,000	1,293

* Rough assessment.

TABLE 53—EXPORT OF FROZEN AND CHILLED MEAT

(Long tons)

Calendar Year.	Beef.	Lamb.	Mutton.	Pork.	Veal.	Other.	Total.
1935 ..	40,879	130,281	51,286	24,582	5,398	7,898	260,324
1936 ..	36,800	130,193	44,193	30,266	5,743	8,795	255,990
1937 ..	42,588	138,492	43,516	29,976	7,519	8,454	270,545
1938 ..	45,288	130,857	51,082	26,062	6,396	8,980	268,665
1939 ..	49,872	138,895	61,763	23,325	11,258	10,198	295,311
1940 ..	66,469	156,427	77,674	26,926	8,316	13,019	348,831
1941 ..	38,455	154,575	34,582	24,511	1,119	11,000	264,242
1942 ..	40,444	182,401	35,119	13,521	5,434	10,150	287,069
1943 ..	19,103	160,480	25,287	503	6,320	8,940	220,633
1944 ..	2,977	136,192	54,760	1,965	4,051	7,858	207,803
1945 ..	21,505	166,113	73,160	4,149	7,946	9,819	282,692
1946 ..	54,986	173,447	78,300	9,172	6,515	15,249	337,669
1947* ..	61,246	179,158	76,385	8,397	6,142	16,458	347,786
1948* ..	59,644	183,227	66,203	9,482	8,242	16,699	343,497
1949* ..	51,133	190,017	66,909	8,673	7,886	19,483	344,101
1950* ..	50,606	185,713	68,221	9,750	8,418	15,376	338,084

* Provisional.

NOTE.—The apparent decline in exports of meat and dairy-produce during the war years (see Tables 53 and 56) was due to the large quantities of produce that were supplied to the United States Joint Purchasing Board for the use of armed forces in the Pacific war theatre and in New Zealand.

TABLE 54—TOTAL BUTTERFAT PRODUCTION (ESTIMATED)

For years ended 31 July. Estimated total is computed as at the milk pail—that is, it includes whole milk fed to calves, butterfat lost in separation, and milk and cream spilt and wasted.

Season.	Tons of Butterfat to Nearest 100 tons.	Butterfat in Million lb.	Cows in Milk, in Thousands.	Butterfat Per Cow to Nearest lb.
Old Series (Year ended 31 July)—				
1925–26	104,400	233·9	1,181	198
1926–27	115,500	258·7	1,182	219
1927–28	118,000	264·2	1,243	213
1928–29	129,000	289·1	1,291	224
1929–30	140,200	314·1	1,390	226
1930–31	143,800	322·0	1,500	215
1931–32	151,700	339·8	1,583	215
1932–33	177,300	397·1	1,724	230
1933–34	190,500	426·7	1,816	235
1934–35	183,000	409·9	1,828	224
New Series (Year ended 30 June)—				
1935–36	195,100	437·0	1,823	240
1936–37	204,600	458·2	1,805	254
1937–38	194,200	434·9	1,764	247
1938–39	178,700	400·3	1,744	230
1939–40	192,200	430·6	1,740	247
1940–41	208,200	466·3	1,780	262
1941–42	195,200	437·3	1,777	246
1942–43	181,600	406·8	1,736	234
1943–44	172,900	387·3	1,669	232
1944–45	192,700	431·7	1,700	254
1945–46	166,200	372·4	1,683	221
1946–47	182,200	408·1	1,678	243
1947–48	186,500	417·8	1,734	241
1948–49	204,200	457·3	1,767	259
1949–50	210,200	470·9	1,866	252

TABLE 55—BUTTER AND CHEESE PRODUCTION, YEAR ENDED 30 JUNE

(Thousand tons)

	Creamery Butter.	Whey Butter.	Farm* Butter.	Total Butter.	Total Cheese.
1933–34 to 1938–39 (average)	154·6	2·4	2·6	159·6	89·7
1939–40 to 1944–45 (average)	145·2	3·1	2·8	151·1	112·5
1945–46 to 1947–48 (average)	138·9	2·6	3·6	145·1	90·8
1948–49	163·0	2·8	3·6	169·4	99·4
1949–50	165·8	3·0	3·1	171·9	105·4

* Estimates.

TABLE 56—EXPORTS OF BUTTER, CHEESE, AND PROCESSED MILK PRODUCTS, YEAR ENDED 30 JUNE

	Butter. Tons.	Cheese. Tons.	Casein. Tons.	Milk, Dried. Tons.	Milk and Cream, Preserved. Tons.
1935–36	139,332	81,020	3,855	7,915	3,219
1936–37	149,568	83,111	4,050	6,462	3,172
1937–38	145,887	84,542	2,881	6,902	3,298
1938–39	123,389	79,962	1,427	7,513	2,601
1939–40	115,984	87,450	2,131	7,811	3,238
1940–41	134,489	125,282	890	9,121	3,105
1941–42	107,095	131,658	116	8,468	5,183
1942–43	102,889	111,306	542	9,088	1,656
1943–44	103,589	80,000	627	6,811	557
1944–45	121,147	93,041	750	9,975	2,733
1945–46	105,529	78,425	715	8,133	6,234
1946–47	117,750	88,312	2,171	14,529	8,811
1947–48	127,055	83,226	3,790	14,598	8,060
1948–49	147,446	83,359	5,055	20,493	11,741
1949–50	148,176	89,689	4,799	25,577	10,930

TABLE 57—WOOL PRODUCTION AND EXPORTS
(Million lb.)

Year.	Estimated Production (Season Ended 30 June).	Exports (Calendar Year).	Year	Estimated Production (Season Ended 30 June).	Exports (Calendar Year).
1920	174	162·3	1946	365	365·4
1925	201	205·7	1947	367	375·1
1930	273	197·2	1948	362	421·0
1935	265	222·7	1949	367	429·7
1940	310	300·3	1950	390	394·0
1945	372	166·0			

TABLE 58—VALUE OF NEW ZEALAND'S EXPORTS
(Million £ N.Z.)*

Year.	Butter.	Cheese.	Frozen Meat.	Wool.	Other Items.	Total.
1920	3·0	6·2	11·7	11·9	13·6	46·4
1925	10·2	5·8	11·2	17·7	10·3	55·2
1930	11·9	6·4	10·9	7·7	8·0	44·9
1935	13·6	4·4	12·8	7·1	8·6	46·5
1940	18·2	8·2	19·7	16·9	10·7	73·7
1945	19·3	9·5	17·6	12·7	22·4	81·5
1949	35·4	12·7	27·2	46·6	25·5	147·4
1950	34·9	14·3	28·5	74·7	31·4	183·8

* Including re-exports.

TABLE 59—AREAS AND PRODUCTION OF CASH CROPS

A. AREAS (Acres)

	1935–39 (Average).	1940–45 (Average).	1946–50 (Average).	1949–50.
Wheat—				
For threshing	214,209	243,900	139,608	125,126
For chaff, hay, and silage	1,778	1,172	804	693
Not harvested (fed off, &c.)	2,564	2,466	1,701	2,361
Oats—				
For threshing	63,426	60,989	61,336	52,645
For chaff, hay, and silage	197,057	136,012	70,725	53,910
Not harvested (fed off, &c.)	56,153	62,602	47,412	55,116
Barley—				
For threshing	22,399	31,256	56,142	56,916
For chaff, hay, and silage	765	647	628	437
Not harvested (fed off, &c.)	6,066	6,767	9,661	13,156
Maize—				
For threshing	6,863	8,160	7,212	7,229
For silage	399	152	107	61
Not harvested (fed off, &c.)	7,046	5,722	6,194	4,945
Peas for threshing	19,004	34,825	45,366	41,319
Beans for threshing	138	291	196	313
Linseed for threshing	1,567	1,550	11,331	7,535
Linen flax	Nil	12,872	4,144	2,791
Potatoes	21,908	22,174	20,223	17,785
Onions	772	1,078	1,245	887
Tobacco (contract acreage)	2,382*	2,947	3,965	3,899

B. PRODUCTION

	1935–39.		1940–45.		1946–50.		1949–50.	
	Yield Per Acre (Average).	Total (000's).	Yield Per Acre (Average).	Total (000's).	Yield Per Acre (Average).	Total (000's).	Yield Per Acre (Average).	Total (000's).
Wheat (bushel)	31·34	6,714	33·49	8,168	37·63	5,240	39·14	4,898
Oats (bushel)	44·03	2,793	47·80	2,916	47·97	2,935	49·77	2,620
Barley (bushel)	36·96	828	34·95	1,092	38·16	2,135	42·75	2,433
Maize (bushel)	45·49	312	50·49	412	53·99	389	64·02	463
Peas (bushel)	23·57	448	23·80	829	25·02	1,125	30·08	1,243
Beans (bushel)	20·10	3	23·35	7	24·59	5	25·70	8
Linseed (cwt.)	6·60	10	5·70	†9	N.A.	N.A.	N.A.	N.A.
Potatoes (tons)	5·39	118	5·65	125	6·51	131	7·65	136
Onions (tons)	7·85	6	9·50	10	9·00	11	9·45	8
Tobacco (lb.)	661·0	1,575*	997·7	2,939	1,169·10	5,242	1,208·84	4,712

* 1936–39 average. † 1939–40 only. N.A., not available.

TABLE 60—AREAS OF PRINCIPAL FODDER CROPS

Crop.	1935–39 (Average). Acres.	1940–45 (Average). Acres.	1946–50 (Average). Acres.	1949–50. Acres.
Grasses and clovers cut for hay ..	422,535	458,653	489,057	494,932
Grasses and clovers cut for silage ..	75,029	62,983	55,326	83,534
Lucerne cut for hay or silage ..	38,892	43,078	45,922	52,027
Swedes	369,256	342,725	176,325	175,128
Turnips, white fleshed (soft)			126,580	146,698
Turnips, yellow fleshed (hard) ..			52,484	40,813
Mangels	10,368	7,054	3,179	2,535
Rape	198,331	222,581	163,002	181,777
Kale (including chou moellier) ..			85,352	101,062
Turnips and rape mixed	58,987	46,799	33,684	27,180
Other green fodder (including rape and grain fed off)	52,189	77,557	64,968	75,578
Other green fodder	4,253	7,458	10,750	15,662

TABLE 61—PRODUCTION OF PRINCIPAL FODDER CROPS

Crop.	1935–39 (Average). Tons.	1940–45 (Average). Tons.	1946–50 (Average). Tons.	1949–50. Tons.
Wheat (for chaff, hay, and silage) ..	3,205	2,270	1,571	1,279
Oats (for chaff, hay, and silage) ..	323,972	226,924	128,004	100,198
Maize (for silage)	2,482	700	405	249
Barley (for chaff, hay, and silage) ..	1,579	1,379	1,366	1,491
Grasses and clovers cut for hay ..	785,674	880,962	947,677	1,002,385
Grasses and clovers cut for silage ..	298,985	243,881	234,260	404,138
Lucerne cut for hay or silage	109,413	112,021	110,475	124,040

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PRIMARY PRODUCTION IN NEW ZEALAND

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